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ENVIRONMENTAL  
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# NORTHERN PIKE RAPID RESPONSE PLAN FOR THE COLUMBIA RIVER BETWEEN PRIEST RAPIDS AND CHIEF JOSEPH DAMS AND THE OKANOGAN RIVER

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## Abbreviations

Abbreviation	Definition
AIS	Aquatic Invasive Species
Chelan PUD	Public Utility District No. 1 of Chelan County
CR	Columbia River
CRITFC	Columbia River Inter-Tribal Fish Commission
CTCR	Confederated Tribes of the Colville Reservation
DOE	Department of Ecology
Douglas PUD	Public Utility District No. 1 of Douglas County
eDNA	environmental deoxyribonucleic acid
ESA	Endangered Species Act
Grant PUD	Public Utility District No. 2 of Grant County
ICS	Incident Command System
MAC Group	Multi-Agency Coordinating System
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPM	Northern Pikeminnow
Plan	Rapid Response Plan
PUD	Public Utility District
RCW	Revised Code of Washington
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WGA	Western Governors' Association
WISC	Washington Invasive Species Council
WRP	Western Regional Panel
WS	White Sturgeon
Yakama Nation	Confederated Tribes and Bands of the Yakama Nation

# 1 Introduction

Northern Pike *Esox lucius*, are non-native aquatic invasive species (AIS) that have invaded multiple habitats within Washington State. Illegal stocking in the 1950s in Montana rivers<sup>1</sup> outside their native drainage contributed to their establishment in the Columbia River Basin. By the 1970s, they had expanded their range into the Flathead River system and a separate illegal introduction also occurred in the Coeur d'Alene River system (Bernall and Moran 2005). Since that time, Northern Pike have steadily expanded their distribution downstream to include the Pend Oreille River, Spokane River (Bennett and Rich 1990; Scholz et al. 2009), and the Columbia River upstream of Grand Coulee Dam (Figure 1; CTCR et al. 2018).

Northern Pike are highly piscivorous. They can consume substantial quantities of native salmonids and cause impactful declines in prey populations (Sepulveda et al. 2014). Concerns about potential impacts from predation has led the Western Governors' Association to designate Northern Pike as a "Top 25" AIS (WGA 2018).

Given their propensity to invade downstream habitats, it is likely that Northern Pike will eventually expand their distribution below Grand Coulee and Chief Joseph dams on the Columbia River. Preventing Northern Pike from becoming established in these waters is critically important to protect native anadromous and resident species, including Endangered Species Act (ESA) listed salmonids, from predation and potential population declines.

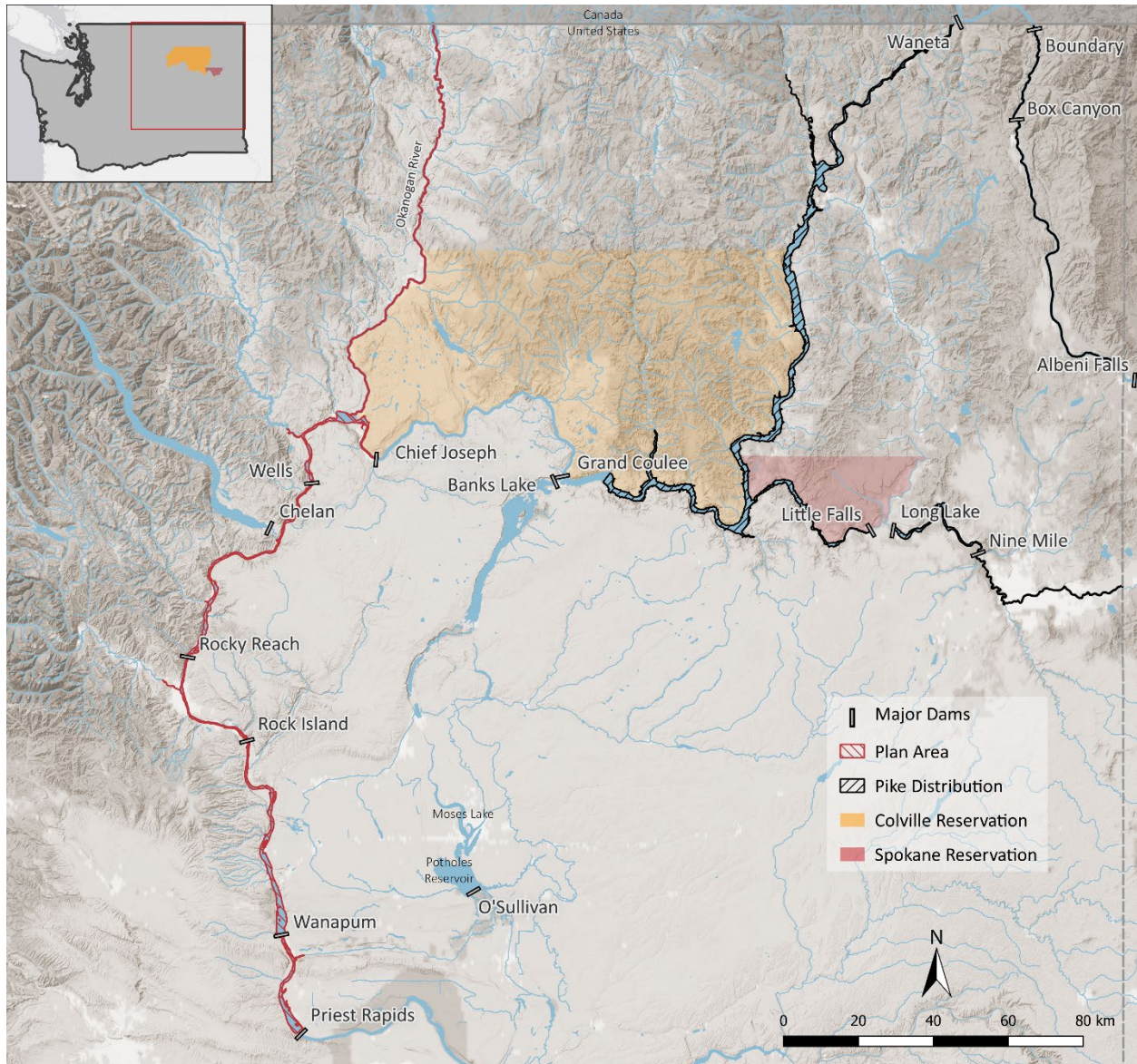
Keeping Northern Pike from spreading farther downstream in the Columbia River poses a difficult challenge and will require focused efforts to detect and rapidly respond to initial invasion events. These considerations have led to the development of this Rapid Response Plan ("Plan") which attempts to leverage the combined expertise and resources of fisheries managers and other stakeholders to address this challenge.

## 1.1 Plan Area

The Plan focuses on waters of the Columbia River downstream of Chief Joseph Dam and its tributaries where Northern Pike are most likely to invade. Specifically, the Plan has been developed for the section of Columbia River between Chief Joseph and Priest Rapids dams and the Okanogan River to the Canadian border (Figure 1).

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<sup>1</sup> <https://wdfw.wa.gov/species-habitats/invasive>



**Figure 1. Area of concern (“Plan Area”) defined by the Northern Pike Rapid Response Plan and proximity to current Northern Pike distribution in Washington State.**

## 1.2 Plan Purpose

The Plan has been developed out of recognition that Northern Pike present a direct threat to multiple native anadromous and resident fish species in the Columbia River. For ESA-listed salmonids, Northern Pike pose a more substantial threat as these species are already at low abundance and at risk of extirpation. The basic purpose of the Plan is to protect native ESA-listed and unlisted species that are present in the Columbia River below Chief Joseph Dam, including the following:

ESA-listed native salmonids:

- Upper Columbia River steelhead *Oncorhynchus mykiss* (endangered)
- Upper Columbia River spring-run Chinook Salmon *O. tshawytscha* (endangered)



- Bull Trout *Salvelinus confluentus* (threatened)

Unlisted native salmonids and other species of interest:

- Wenatchee River Sockeye Salmon *O. nerka*
- Okanogan River Sockeye Salmon
- Upper Columbia River summer-run Chinook Salmon
- Upper Columbia River fall-run Chinook Salmon
- Coho Salmon *O. kisutch*
- Redband Rainbow Trout *O. mykiss*
- Pacific Lamprey *Entosphenus tridentatus*
- White Sturgeon *Acipenser transmontanus*

### 1.2.1 Plan Objectives

The best chance of stemming the invasion of Northern Pike is through communication and collaboration among those entities that have the expertise and resources to detect and respond to Northern Pike within the Plan Area. As such, the primary objective of the Plan is to serve as a coordination document and technical resource to enhance the efficiency and effectiveness of detection and early response activities necessary to prevent the progression of Northern Pike invasion within the Columbia River. Secondly, the Plan provides communication guidance to ensure that verification and detection information is disseminated to fisheries managers and stakeholders to inform subsequent management decisions. These objectives can be distilled into the following:

1. Maximize the probability of early detection of Northern Pike in the Plan Area (i.e., from Priest Rapids Dam upstream to Chief Joseph Dam including the Okanogan River to the Canadian border)
2. Establish capacity to act within the first 48 hours of a Northern Pike detection
3. Provide a systematic approach to verify a detection and investigate the distribution within the Plan Area
4. Provide clear communication and reporting guidance to trigger follow-on management actions no later than 6 weeks after the initial detection

It is important to note that the scope of the Plan is limited to initial detection and early response activities and is not intended to address long-term management actions such as removal, control, or eradication efforts that should be implemented if Northern Pike become established within the Plan Area.

### 1.2.2 Incident Command System

Incident Command System (ICS) protocols will be used to address a possible invasion of Northern Pike in the Plan Area. The ICS provides Washington Department of Fish and Wildlife (WDFW) a standardized protocol for cooperation and coordination among federal, state, and local governments, and other entities. Initiating ICS enables WDFW to mobilize resources and fast track permits and funding necessary to assist with rapid response actions. The ICS also minimizes known challenges of a rapid response, including unclear chains of command, poor communication, lack of Standard Operating Procedures, and a lack of clear resource management (when and how to deploy resources as the incident changes). The

current Plan was developed to address common challenges of the ICS and provide specific details relevant to a response within the Plan Area.

### *1.2.3 Multi-Agency Coordinating System and Responding Entities*

The successful implementation of the Plan will rely on the combined expertise and resources of fisheries managers, public utility districts (PUDs), and other regional stakeholders. The nine entities listed in this section will be part of the multi-agency coordinating system (MAC Group). Together they will implement ICS protocols.

Within the context of the Plan Area, Confederated Tribes of the Colville Reservation (CTCR), Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), and WDFW are recognized as co-managers of anadromous and resident fisheries resources within parts of the Columbia River and its tributaries. The Revised Code of Washington (RCW) 77.135.020 states that WDFW is the lead agency for managing invasive species of the animal kingdom where they have management authority. It is assumed that WDFW will be the Rapid Response Lead if ICS is initiated, although WDFW may designate another entity if desired. Of note, WDFW is currently developing a statewide Northern Pike Rapid Response Plan that will also use the ICS framework.

The National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) are federal fisheries managers with jurisdiction over ESA-listed species and administration of incidental take authorizations for fisheries management activities or Federal Energy Regulatory Commission (FERC) license implementation. While the plan itself does not have ESA take coverage for Plan activities, the individual entities within the Plan maintain ESA coverage for sampling activities that may occur during plan implementation.

The three PUDs (Grant, Chelan, and Douglas) operate hydroelectric projects within the Plan Area and implement FERC licenses and/or Habitat Conservation Plan measures to ensure that native salmonids meet survival standards within their project boundaries. As part of their FERC license commitments, the PUDs are required to have an AIS management plan and monitor and respond to AIS issues.

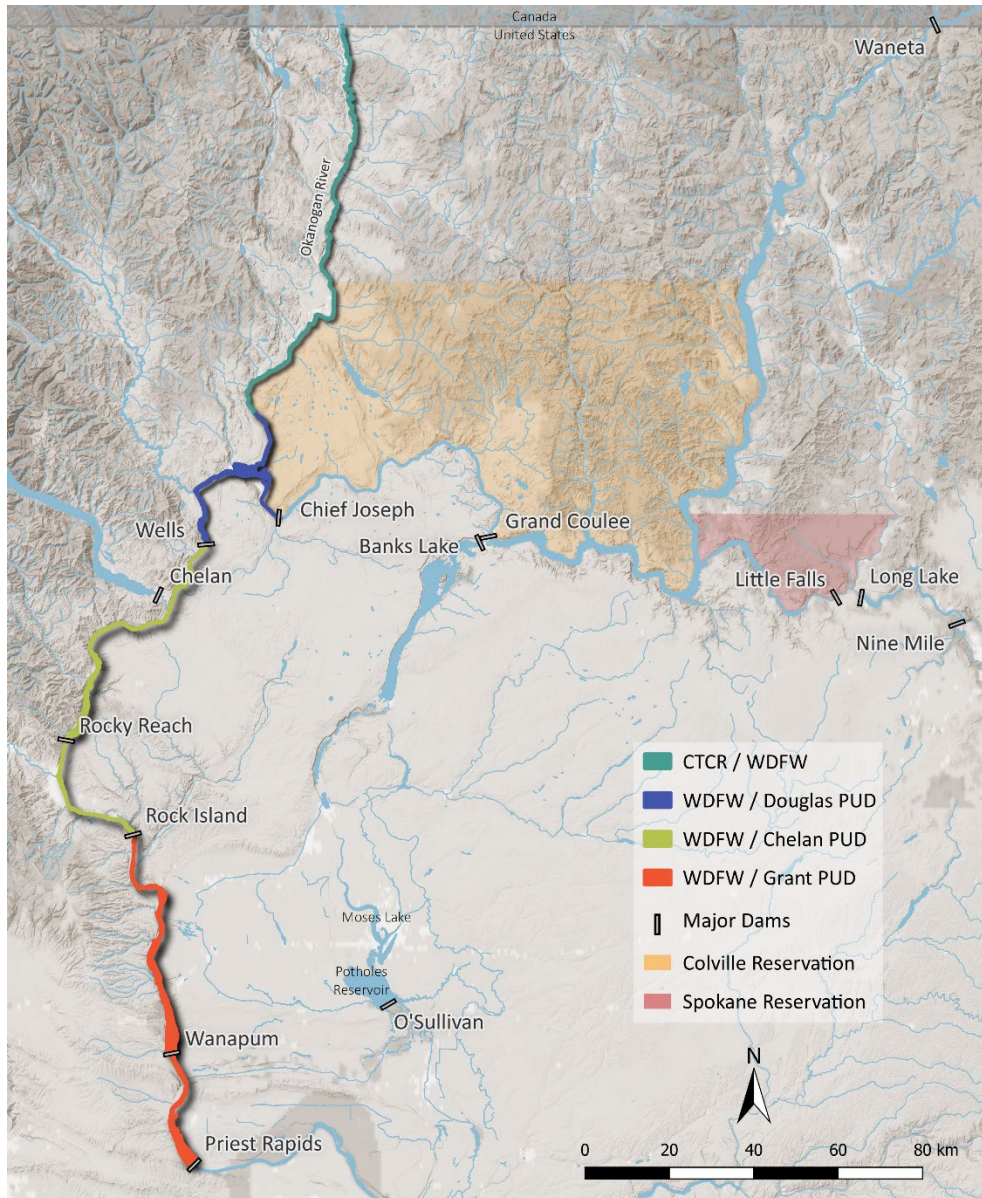
The Washington Invasive Species Council (WISC) provides policy-level direction, planning, and coordination for combating harmful invasive species throughout the state and preventing the introduction of others that may be potentially harmful. Members include representatives from federal, state, and local governments, one tribe, and one nonprofit organization.

The MAC Group participants that have the capability to provide staff, equipment, and other resources to support the Plan activities have been identified as the Responding Entities (Table 1; Figure 2). The Responding Entities have a combination of one or more of the following attributes: fisheries management authority, proximity to the Plan Area; and the capability to provide staff, equipment, and other resources to support Plan activities. Designated points of contact willing to act as a Rapid Response Lead (Section 5.1) within these Responding Entities have been pre-coordinated to facilitate a rapid response (Table 1). It should be noted that the focus on Responding Entities is not intended to limit participation in the Plan by other MAC Group participants or a broader stakeholder group. The entities initially identified here are positioned to provide rapid on-the-ground support or regulatory approvals for Plan activities, but additional support or involvement by other entities and stakeholders is encouraged.

Ultimately, if a Northern Pike is detected along tribal or federal lands, the state will default to the associated entity and wait for the Tribe or Federal Agency to request ICS. By contrast, if a Northern Pike is detected in other Plan Area waters, WDFW will request ICS and coordinate closely with specified Responding Entities for Rapid Response Activities.

**Table 1. The MAC Group Responding Entities and Designated Points of Contact per waterbody in the Plan Area.**

<b>Waterbody</b>	<b>Responding Entity</b>	<b>Designated Point of Contact</b>
Wells Reservoir	WDFW / Douglas PUD	Jesse Schultz / Chas Kyger
Okanogan River Upstream of Monse Bridge	CTCR / WDFW	Holly McLellan / Jesse Schultz
Rocky Reach Reservoir	WDFW / Chelan PUD	Jesse Schultz / Bill Towey
Rock Island Reservoir	WDFW / Chelan PUD	Jesse Schultz / Bill Towey
Wanapum Reservoir	WDFW / Grant PUD	Jesse Schultz / Tom Dresser
Priest Rapids Reservoir	WDFW / Grant PUD	Jesse Schultz / Tom Dresser



**Figure 2. Spatial depiction of areas of coverage for Responding Entities within the Plan Area.**

#### *1.2.4 Consistency with Fisheries Management Roles*

The Plan is intended to be consistent with the management authorities of tribal, state, and federal fisheries managers and their respective jurisdictions. The Plan does not refine, change, or otherwise limit the authority of any fisheries manager.

#### *1.2.5 Consistency with FERC Licenses*

The Plan is intended to be consistent with resource management plans and commitments made by local PUDs within their existing FERC licenses. The plan does not modify any FERC license, settlement agreement, or other authorizing certifications or permits.

### *1.2.6 Commitment of Resources*

Participation in the Plan is voluntary. The Plan is not intended to compel or obligate any of the designated Responding Entities to commit resources or conduct activities that are outside of their authority or discretion.

## 2 Plan Overview

The Plan reflects a compilation of existing information and planning efforts that have been used to address Northern Pike and AIS issues regionally. The plan framework and content are intended to be congruent with existing AIS plans and programs and provide enhanced coordination among entities. Other existing plans include guidance on prevention, early detection, removal, control, and eradication, whereas this Plan focuses only on early detection and initial 6-week response within the Plan Area. Additional plans will need to be developed for removal, control, and eradication if Northern Pike become established in the Plan Area.

The Plan is divided into two general activity classifications: 1) Routine Operations and 2) Rapid Response Activities (Figure 3). The basic premise is that information from Routine Operations (i.e., monitoring, detection, and verification steps) may trigger Rapid Response Activities if a verified detection occurs. The Plan is organized sequentially to address the following topics:

- Invasion Pathways and Current Monitoring (Section 3)
- Detection (Section 4)
- Rapid Response Activities (Section 5)
- Fish Sampling Guidelines (Section 5.6.3)
- Public Outreach (Section 7)

Additional technical information is included in the appendices to supplement each topic.

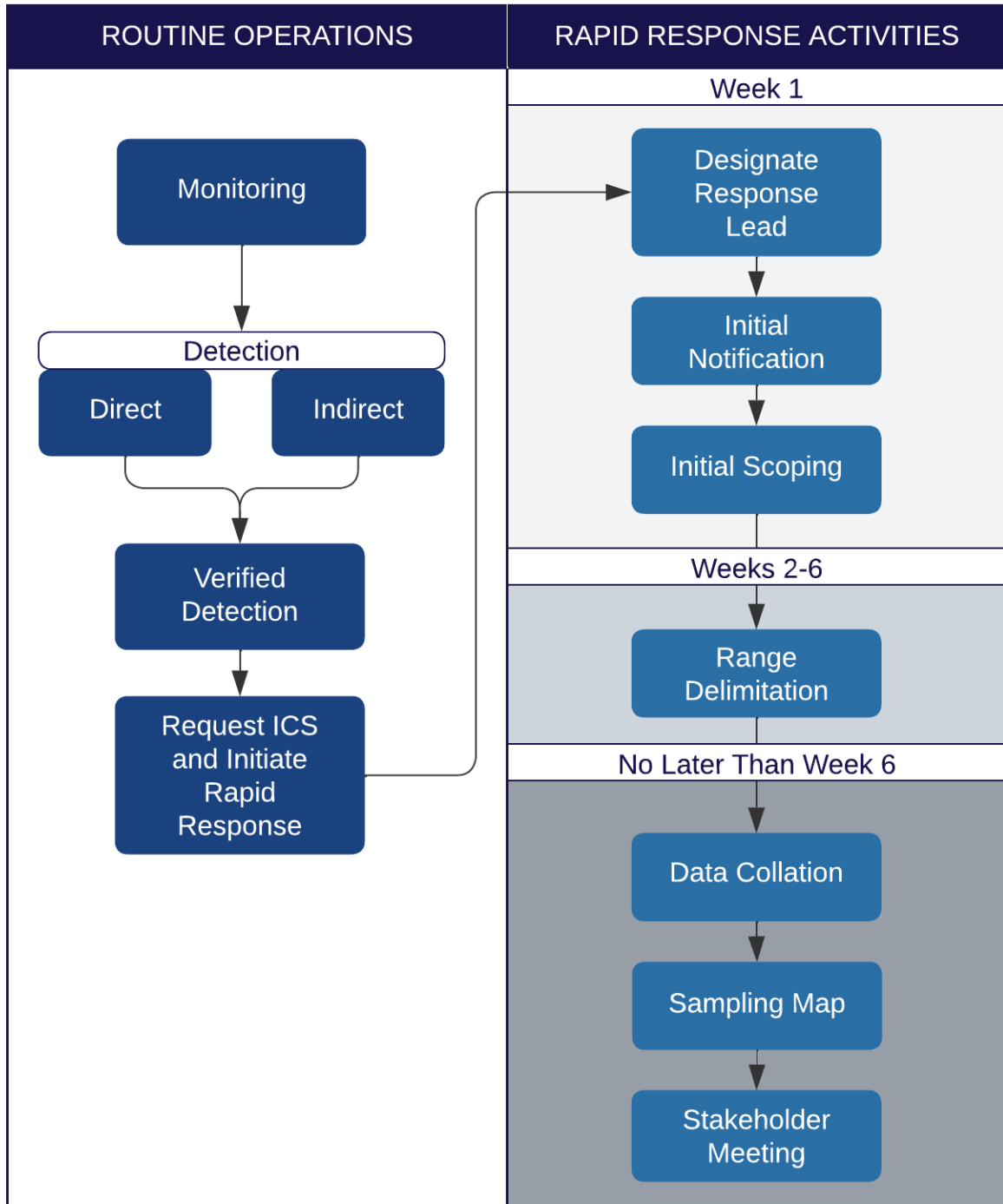


Figure 3. Overview of the Northern Pike Rapid Response Plan Flow.

## 2.1 Waterbody Classification

Once Rapid Response Activities are initiated, a key goal is to provide data to assist with definitively determining the classification of the affected waterbody as it relates to invasive species based on the guidelines set forth by the Western Regional Panel on Aquatic Nuisance Species (WRP 2020).

- Status Unknown – Waters that have not been monitored.
- Undetected/Negative – Sampling/testing is ongoing and nothing has been detected, or nothing has been detected within the timeframes for de-listing.
- Inconclusive (temporary status) –Waterbody has not met the minimum criteria for a verified detection (e.g., one eDNA positive result(s) of 1/3, 2/3, or 3/3) and no physical specimen collected. Verification Sampling is initiated (Section 4).
- Suspect – Waterbody that has met the minimum criteria for verified detection. There is a single verified detection (e.g., at least two independent eDNA positive results) within the waterbody, but no physical Northern Pike specimen has been captured. Verification Sampling is continued (Section 4).  
Rapid Response may be considered but is not recommended without a physical specimen.
- Positive – Multiple (2 or more) verified detections from subsequent sampling events to include at least one Northern Pike specimen collected. **Rapid Response is initiated (Section 5).**
- Infested – A waterbody has an established population of Northern Pike.

Any single observation of a Northern Pike through capture, eDNA, sighting, or other method must be verified prior to the initiation of any Rapid Response Activities. A verified detection requires that two independent results from the same sample conclude the sample is positive for Northern Pike using scientifically accepted techniques (e.g., DNA analysis, taxonomic identification; Section 4).

## 2.2 Waterbody Reclassification

Waterbodies may also be reclassified after additional sampling and/or suppression has occurred. The protocol to move backwards from a Positive detection depends on the initial waterbody classification:

- Suspect– 1 year of negative testing and no Northern Pike collected.
- Inconclusive – 3 years of negative testing and no Northern Pike collected.
- Negative – 5 years of negative testing and no Northern Pike collected.



## 3 Invasion Pathways and Current Monitoring

### 3.1 Invasion Pathways

A comprehensive study of invasion pathways was not conducted for this rapid response plan. However, the likely invasion pathways for the Plan Area include:

- Downstream expansion from Lake Roosevelt via Rufus Woods Reservoir
- Expansion from adjacent lakes, reservoirs, and irrigation channels (e.g., Banks Lake, Moses Lake, Potholes Reservoir, Crab Creek)
- Illegal direct introductions

### 3.2 Expected Habitats

Given the regional invasion pathways, key monitoring locations to maximize early detection include tributary mouths, irrigation channel inlets, hydropower facilities, and lakes and reservoirs adjacent to the area of interest. In general, primary Northern Pike habitat has been identified as habitat with maximum depths  $\leq 12.2$  m and slopes  $\leq 23.9^\circ$  from upstream suppression efforts; however, Northern Pike have been captured at depths up to 30 m (CTCR et al. 2018). WDFW also conducted an estimate of Northern Pike spawning habitat in the Plan Area. Spawning habitat parameters used for the estimates were depths  $< 4.6$  m and slopes  $\leq 25\%$  (APPENDIX A).

### 3.3 Monitoring

Monitoring efforts are ongoing throughout the region, led by various regional entities. Each entity owns the method, the data collection protocols, and the data. The intent of this section is to provide insight into these efforts.

#### 3.3.1 Within Plan Area

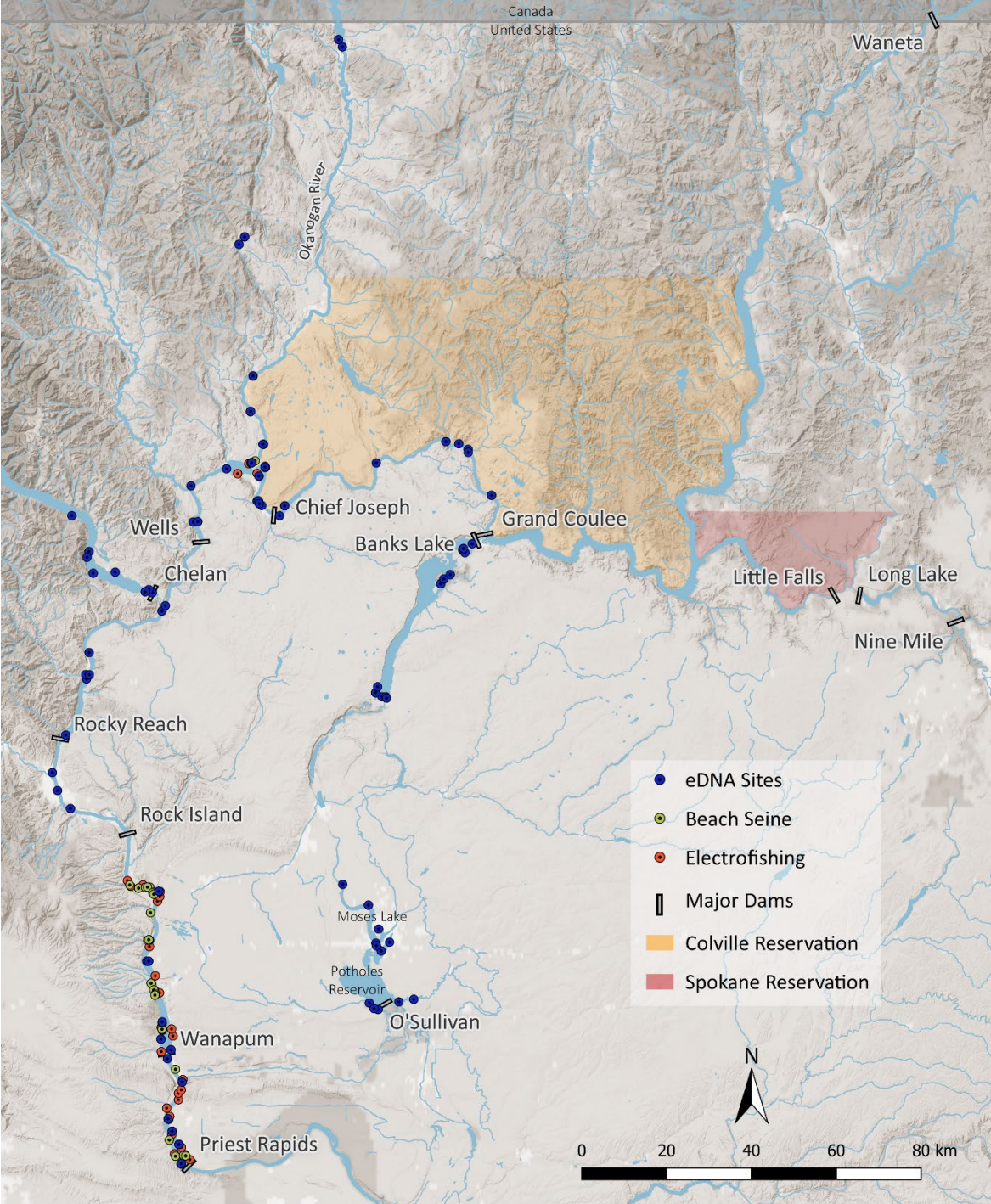
Currently, a large amount of routine monitoring is conducted to evaluate species other than Northern Pike in the Plan Area that may result in a Northern Pike detection. These surveys include White Sturgeon monitoring (set lines), established invasive predator sampling (boat electrofishing, beach seining), resident fish surveys (snorkel surveys, backpack and boat electrofishing), hatchery broodstock collection efforts (trapping, angling, purse seining), creel surveys, fish count systems located at the dam ladders, dewatering of fish ladders, dewatering activities associated with turbine maintenance, and Northern Pikeminnow *Ptychocheilus oregonensis* removal efforts (set lines, angling; Figure 4; Table 2).

In addition, annual eDNA monitoring is conducted by the PUDs, WDFW, and CTCR specifically for Northern Pike (and other invasive species) in the Plan Area. (APPENDIX B; Figure 4).<sup>2</sup> All of the agencies also participate in public outreach activities through signs posted at boat launches, public radio

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<sup>2</sup> Currently all PUD or CTCR Northern Pike eDNA samples are collected following the Carim et al. 2016 field protocol and are processed at the National Genomics Center for Wildlife and Fish Conservation, which is a part of the U.S. Forest Service Rocky Mountain Research Center. Other eDNA collection protocols and processing facilities are available. A useful resource may be <https://ednaresources.science/edna-labs>. By contrast, WDFW uses an internal collection protocol and lab for processing eDNA samples.

interviews, information booths at various sporting shows, paid social media advertisements, and information on social media platforms (APPENDIX B). These activities are intended to inform the public about the severity of Northern Pike introductions and prepare the public to respond should they encounter a Northern Pike.



Note: Northern Pikeminnow sampling and White Sturgeon monitoring locations (set lines) are not depicted, because these efforts occur broadly throughout each reservoir. Fish counts and ladder dewatering occur at Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids dams.

**Figure 4. Depiction of current Northern Pike or invasive predator sampling efforts downstream of Grand Coulee Dam.**

**Table 2. Spatiotemporal representation of current monitoring coverage by Responding Entities in the Plan Area. Blue indicates efforts that do not occur every year.**

Location	Method	Month													
		1	2	3	4	5	6	7	8	9	10	11	12		
Okanogan (WDFW, CTCR, Douglas PUD)	eDNA			■	■	■	■	■	■	■	■	■	■		
	Weir							■	■	■					
	Beach seines					■	■	■							
	Purse seines							■	■						
Wells (WDFW, Douglas PUD)	eDNA			■	■	■	■	■	■	■	■	■	■		
	Set lines (NPM) <sup>1</sup>			■	■	■	■	■	■	■	■	■	■		
	Set lines (WS) <sup>2</sup>							■	■	■	■				
	Electrofishing			■	■	■	■	■	■	■	■	■	■	■	■
	Fish counts			■	■	■	■	■	■	■	■	■	■	■	■
	Fish ladder dewatering	■	■												■
Rocky Reach/ Rock Island (WDFW, Chelan PUD)	Set lines (NPM)			■	■	■	■	■	■	■	■	■	■	■	■
	eDNA					■	■	■	■	■	■	■	■	■	■
	Angling (NPM)				■	■	■	■	■	■	■	■	■	■	■
	Set lines (WS)										■	■	■	■	■
	Fish counts				■	■	■	■	■	■	■	■	■	■	■
	Fish ladder dewatering	■	■												■
Wanapum/ Priest Rapids (WDFW, Grant PUD)	eDNA			■	■	■	■	■	■	■	■	■	■	■	■
	Set lines (NPM)			■	■	■	■	■	■	■	■	■	■	■	■
	Set lines (WS)							■	■	■	■				
	Beach seines							■	■	■	■				
	Electrofishing				■	■	■	■	■	■	■	■	■	■	■
	Fish counts				■	■	■	■	■	■	■	■	■	■	■
	Fish ladder dewatering	■	■	■										■	■
	Angling	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Notes:

1. NPM = Northern Pikeminnow
2. WS = White Sturgeon

### 3.3.2 Outside of Plan Area

Monitoring in nearby or adjacent waterbodies may provide additional detection pathways for Northern Pike. Annually, WDFW prioritizes waterbodies for monitoring based on an assessment of relative risk of introduction and potential establishment of zebra and quagga mussels, in which they also analyze eDNA samples for Northern Pike (Jesse Schultz, personal communication April 11, 2022). Monitoring upstream of Chief Joseph Dam or in disconnected waterbodies near the Plan Area is conducted via the following methods and entities:

- Resident fish sampling (WDFW) occurs in the lakes listed below. One lake is sampled each year, cycling through all three lakes, such that all three lakes are sampled every 3 years.

- Banks Lake
- Moses Lake
- Potholes Reservoir
- Northern Pike eDNA sampling occurs in the following waterbodies (Figure 4; APPENDIX A):
  - Rufus Woods (WDFW, CTCR)
  - Banks Lake (WDFW, Bureau of Reclamation, CTCR)
  - Moses Lake (WDFW)
  - Potholes Reservoir (WDFW)
- Columbia Basin Entrainment Monitoring Project (WDFW)
  - Esquatzel Diversion Canal smolt trap
  - Ringold Wasteway smolt trap
- Northern Pikeminnow Sport-Reward Program (WDFW)
- Creel surveys (WDFW)

## 4 Detection

Two types of detection data are expected from monitoring activities: direct and indirect. A direct detection enables an external party to verify the fish identification (e.g., carcass in hand, photograph, or fish count video; see Section 4.1 for identification protocol). By contrast, indirect detections do not enable external parties to immediately verify fish identification (e.g., visual sighting or single positive eDNA result).

Prior to verification, the waterbody will be classified as “Inconclusive.” After verification, the waterbody classification will change to either “Suspect” or “Positive” (Section 2.1). An overview of the detection and verification process is depicted in Figure 5.

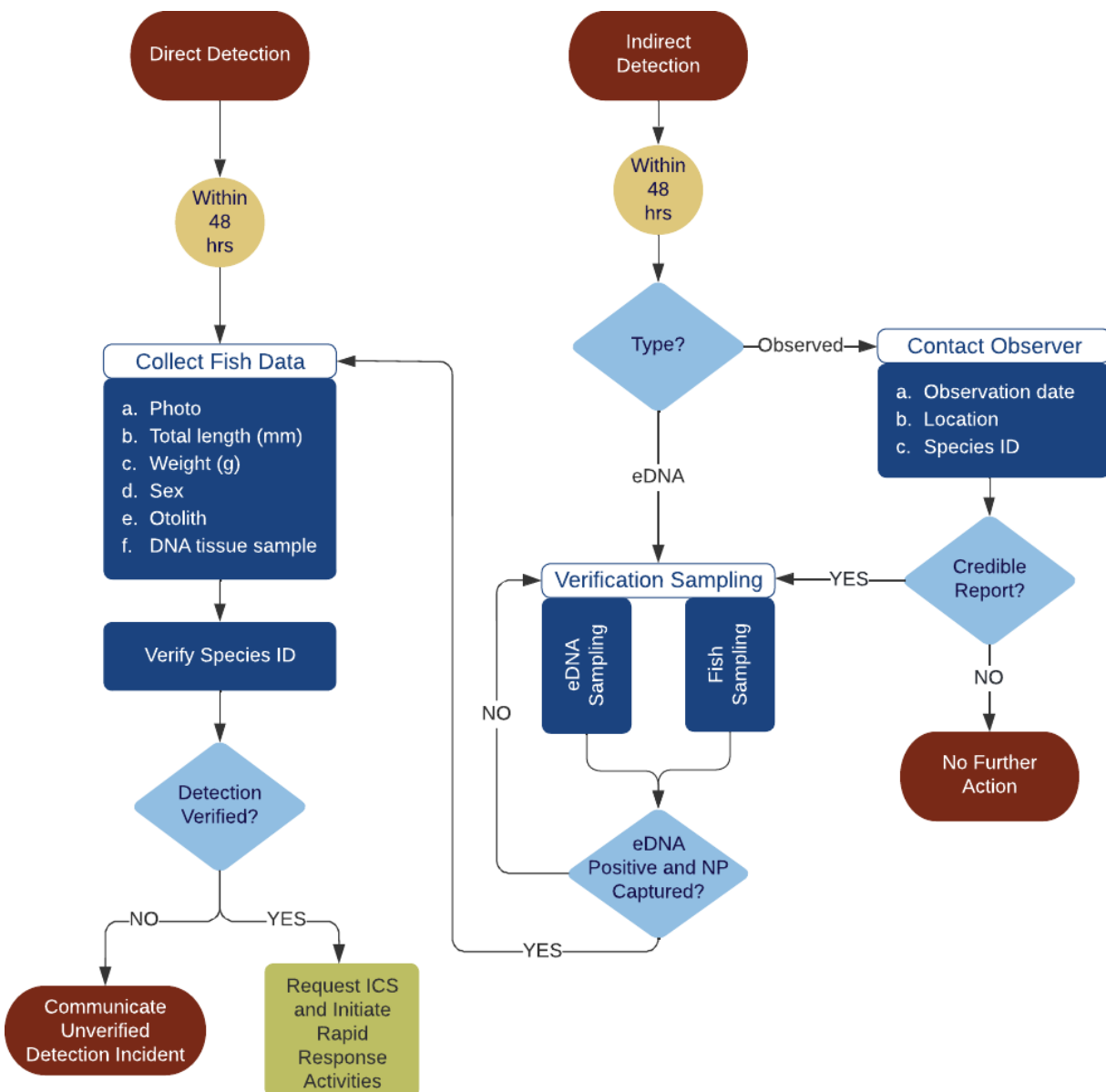


Figure 5. Overview of Detection Verification Process.

## 4.1 Direct Detection

1. Collect fish data (Figure 5; APPENDIX C)
2. Verify species identification
  - a. Send photo to MAC Group representatives and deliver fish carcass to two qualified fisheries experts at the closest WDFW, CTCR, Douglas, Grant, or Chelan PUD office. Fisheries experts will:
    - i. Determine if the specimen is a Northern Pike using keying characteristics (APPENDIX D).
    - ii. If carcass is in hand, re-collect fish data (Figure 5; APPENDIX C).

### 4.1.1 Direct Detection Decision Tree

- If both fisheries experts verify the visual identification of a Northern Pike, then initiate Rapid Response Activities (Section 5). In this instance, the waterbody will be classified as “Suspect” or “Positive.”
- If the specimen is not verified to be a Northern Pike, then make an Unverified Detection Incident Report (Section 4.3). In this instance, the waterbody would remain in an “Undetected/Negative” status (Section 2), because the collected species can be confirmed to be different than a Northern Pike.
- If there is disagreement between fisheries experts, a third fisheries expert shall be consulted to make the conclusive determination.

## 4.2 Indirect Detection

- If a Northern Pike observation is reported to a fisheries expert or a report is made through the Washington Invasive Species Council Reporting Application (APPENDIX B; <https://invasivespecies.wa.gov/report-a-sighting/>), the fisheries expert will:
  - Contact the person who made the report to verify:
    - Date of observation
    - GPS Location or, if not available, a description of the general location
    - That observation was of a Northern Pike versus commonly confused species (e.g., Northern Pikeminnow or Tiger Muskeg *Esox masquinongy x lucius* or *Esox lucius x masquinongy*; APPENDIX D)
  - If the report is deemed credible by the fisheries expert, coordinate Verification Sampling (Section 4.2.1) with the designated Responding Entity (Table 1)
  - If the report is not credible, no further action is required.
- If an eDNA station sample returns a positive result (see below), conduct Verification Sampling (Section 4.2.1). At this point, the waterbody will be classified as “Inconclusive” (Section 2.1).
  - A positive eDNA result is any result that is not 0/3. Typically, eDNA labs run the sample in triplicate which provides the number of positive wells out of three. A result of 0/3 means no DNA was detected. A result of 1/3 or 2/3 indicates a small amount of DNA was detected. These results are usually interpreted with caution as DNA contamination can easily occur while collecting samples and animals can move DNA throughout the environment. A result

of 3/3 typically means there was enough DNA collected and the animal in question was most likely present.

#### *4.2.1 Verification Sampling (within 48 hours of indirect detection)*

An overview of the Verification Sampling process is depicted in Figure 5. Verification Sampling should be executed within 48 hours of the detection report or positive eDNA result and occur within 250 m upstream and downstream (500 m total) of the reported detection location. Verification should always include eDNA sampling but may also include fish sampling depending on the habitat, environmental conditions, and available permits. The Responding Entity for the waterbody within which the detection occurred (Table 1) is responsible for conducting or coordinating Verification Sampling.

##### *4.2.1.1 eDNA Sampling Protocol*

1. Five eDNA samples collected along the shoreline using the Responding Entity's standard protocol should be collected from the immediate area; one sample from each of the following locations relative to the detection location:
  - a. Site of detection
  - b. 100 m upstream
  - c. 250 m upstream
  - d. 100 m downstream
  - e. 250 m downstream
2. Samples should be preserved and shipped overnight to the eDNA processing lab used by the Responding Entity.

##### *4.2.1.2 Fish Sampling Protocol*

- The Field Lead (Section 5.1.2) designated to conduct fish sampling will select at least two of the sampling gear types listed in Section 6.1 for Verification Sampling. Appropriate gear types will vary depending on site conditions (e.g., water depth, flow, substrate) and other constraints such as presence of ESA-listed species or permit availability at the detection location.
  - Ideally, sampling would occur within 500 m of the detection location. However, if habitat attributes, land access, or permitting are restrictive in the detection location, sampling should be conducted in preferred-type Northern Pike habitat as close to the detection location as feasible (APPENDIX A).
  - Expected effort is annotated in Section 5.6.3 and the data collection worksheets in APPENDIX C.

##### *4.2.1.3 Indirect Detection Verification Sampling Decision Tree*

- If Verification Sampling produces all negative eDNA results and/or no observations of Northern Pike during fish sampling, make an Unverified Detection Incident Report (Section 4.3). At this point, the waterbody would revert to "Undetected/Negative."
- If Verification Sampling produces a positive eDNA result (1/3, 2/3, or 3/3) but no Northern Pike are physically collected, repeat eDNA sampling AND implement fisheries techniques that allow the capture of fish (Section 6.1). At this point, the waterbody would revert to "Suspect."



- If the second round of eDNA sampling produces similar results, but no Northern Pike are collected, the waterbody will remain classified as “Suspect.” Conduct monthly eDNA Verification Sampling at the site.
  - The waterbody will remain in an “Suspect” status until a Northern Pike is collected or after 1 year of negative testing with no Northern Pike collected (Section 2.2).
- If a Northern Pike is verified captured, request ICS and initiate Rapid Response Activities (Section 5). The waterbody will be classified as either “Suspect” or “Positive,” depending on the number of verified samples and if a Northern Pike is captured.

### 4.3 Unverified Detection Incident Reports

Unverified Detection Incident Reports provide an opportunity to identify trends and patterns that might indicate presence of Northern Pike at low abundance that might otherwise be missed (e.g., increased frequency of unverified detections, spatial patterns that suggest a low abundance of fish are moving throughout the system). Thus, it is recommended that every unverified detection incident be declared and communicated to the MAC Group. In addition, WDFW maintains a centralized data repository of eDNA sample results, reported by the Responding Entities each year. While this information is available to the region, it is recommended that each Responding Entity also design its own tracking system to assist with identifying unverified detection incident trends.

Critical information to include in Unverified Detection Incident Reports is:

- Date of reported unverified detection
- Method of unverified detection (e.g., eDNA, angler report, sighting)
- Summary of Verification Sampling conducted
- Declaration of unverified detection

## 5 Rapid Response Activities

The intent of the Plan is to identify Northern Pike colonization or range expansion events within a short period of time (6 weeks). The following sampling schemata were developed to confirm the presence of one or more Northern Pike in the Plan Area and to determine if Northern Pike are localized or broadly distributed throughout the Plan Area. Given that there are multiple invasion pathways for Northern Pike, it is feasible that Northern Pike could be localized to individual reservoirs without having spread throughout the entire region. Understanding the upstream and downstream limits of the current invasion will be essential to future development of monitoring and suppression plans.

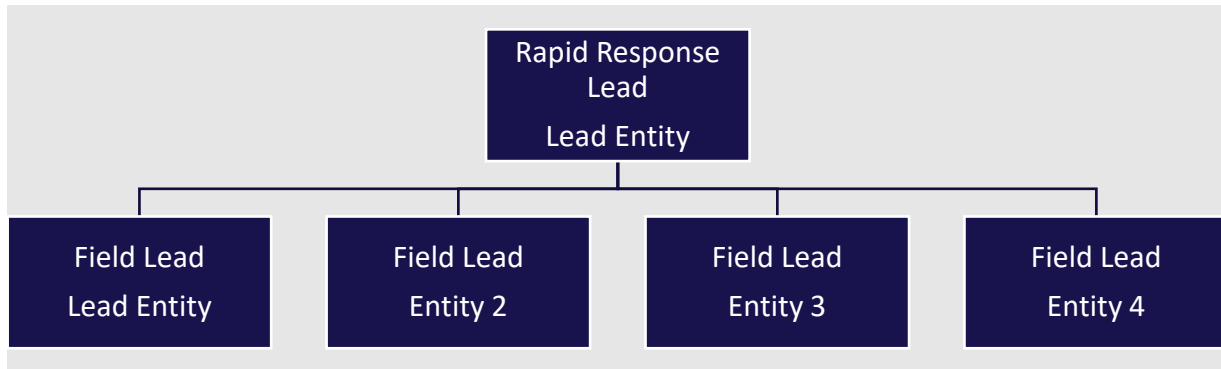
The 6-week Rapid Response Activities include the following steps (Figure 3):

1. Week 1
  - a. Inform the MAC Group and request ICS. The designated Rapid Response Leads begin Rapid Response Coordination (Section 5.1)
  - b. Send out Initial Notification (Section 5.2)
  - c. Conduct Initial Scoping (Section 5.3)
2. Weeks 2-6
  - a. Conduct Range Delimitation (Section 5.4)
3. Week 6 (or sooner contingent on range delimitation effort required)
  - a. Rapid Response Leads summarize the results of the Range Delimitation activities into a brief report that includes a map (Section 5.5)
  - b. Host a stakeholder meeting (Section 5.6) that includes the MAC Group (Section 1.2.2) and the regional stakeholders listed in Table 3.

### 5.1 Rapid Response Leadership

Adherence to a clear and repeatable organizational structure (Figure 6) will ensure that Rapid Response Activities are coordinated effectively. WDFW will be the Rapid Response Lead per Washington State Law (RCW 77.135.020) unless the land is managed by the Federal Government or a tribal entity. If a Northern Pike is detected along CTCR lands, CTCR will assume the lead and will likely request ICS and designate WDFW as the Rapid Response Lead. The Rapid Response Lead will keep the MAC Group informed and updated throughout the 6-week Rapid Response.

The Rapid Response Lead will coordinate with the Responding Entities (Table 1) to designate Field Lead(s) for each waterbody affected. If there are additional detections in other waterbodies discovered during the Rapid Response Activities, appropriate Field Leads from other Responding Entities should be designated to conduct sampling (Figure 2). All Field Leads should report to the designated Rapid Response Lead regardless of which entities become involved (Table 1). All information about the sampling protocols being employed and all data collected during sampling efforts should be provided to the Rapid Response Lead no later than 6 weeks after Rapid Response initiation.



**Figure 6. An example Rapid Response organizational chart for the scenario where there are detections in multiple waterbodies assigned to four different entities.**

### *5.1.1 Rapid Response Lead Responsibilities*

The Rapid Response Lead is responsible for the following activities associated with Rapid Response Activities:

- Initiate the Rapid Response Activities
- Manage the Rapid Response timeline and coordinate with Field Leads to collect and disseminate information
- Lead communications about the Rapid Response efforts (e.g., initial notification [Section 5.2], status updates)
- Track the progress of Rapid Response sampling conducted by Field Leads
- Provide guidance at decision points
- Summarize data collected from Field Leads
- Develop the deliverables required for the stakeholder meeting (Section 5.6.1)
- Schedule the stakeholder meeting (Section 5.6)
- Lead the stakeholder meeting discussion

### *5.1.2 Field Lead Responsibilities*

The Field Lead is a person or group of people designated to conduct Rapid Response sampling in various waterbodies within the Plan Area. Field Leads are responsible for the following activities:

- Conduct sampling and collect data according to Rapid Response Activities in assigned waterbodies using data collection worksheets provided in APPENDIX C
- Provide a summary of executed sampling protocols and data to the Rapid Response Lead by the end of the Rapid Response period (week 6 following initiation)
- Support the Rapid Response Lead
- Participate in the stakeholder meeting discussion

## **5.2 Initial Notification**

Notification of a verified Northern Pike detection to the MAC Group should occur immediately upon detection verification. An Initial Notification template is provided in APPENDIX E to assist with communications. The template includes the following information to be provided during the initial notification:

- Name and contact information for the Rapid Response Lead
- Name and contact information for any designated Field Leads
- Date of Northern Pike detection
- Location of Northern Pike detection
- Type of detection (direct versus indirect)
- A description of Verification Sampling conducted and associated results
- A short description of the planned Initial Scoping (Section 5.3) efforts

Responding Entities will each coordinate with their internal public relations/communications departments to develop and distribute appropriate messaging.

**Table 3. Notification table to inform regional stakeholders of the initiation and eventual results of a Northern Pike Rapid Response.**

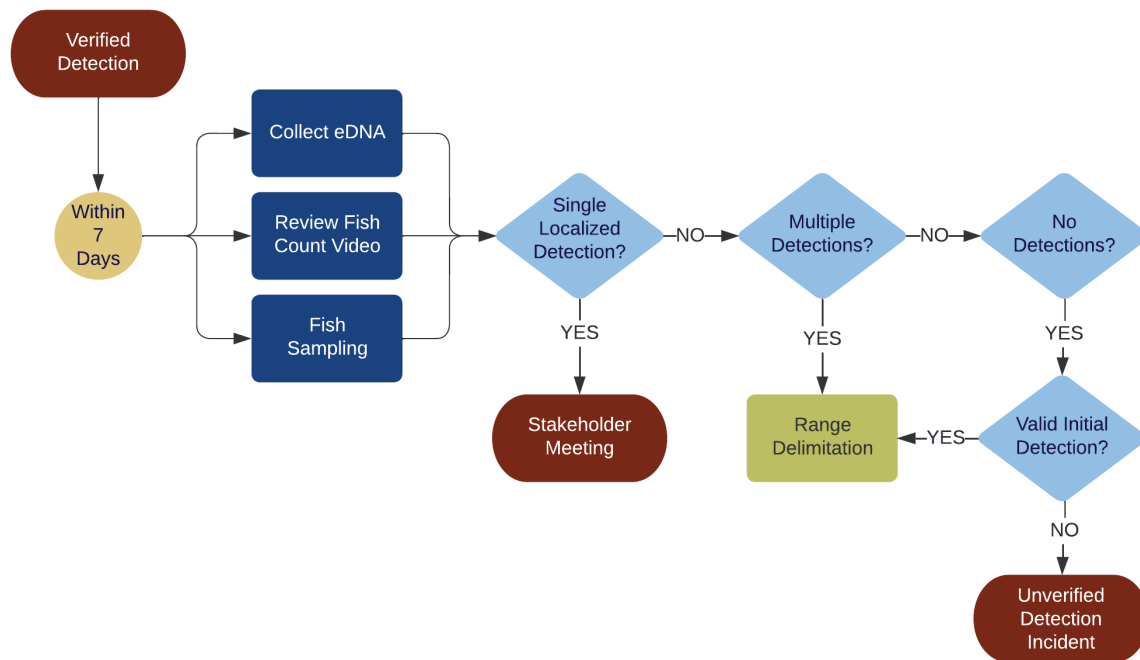
Entity	Contact Name	Email	Phone Number
Bureau of Reclamation	Sarah Fesenmyer	<a href="mailto:sfesenmyer@usbr.gov">sfesenmyer@usbr.gov</a>	208-292-7968
Chelan PUD	Bill Towey	<a href="mailto:bill.towey@chelanpud.org">bill.towey@chelanpud.org</a>	509-661-4688
	Marcie Clement	<a href="mailto:marcie.clement@chelanpud.org">marcie.clement@chelanpud.org</a>	509-661-4186
	Scott Hopkins	<a href="mailto:scott.hopkins@chelanpud.org">scott.hopkins@chelanpud.org</a>	509-661-4763
CRITFC <sup>1</sup>	Blaine Parker	<a href="mailto:parb@critfc.org">parb@critfc.org</a>	503-731-1268
CTCR	Bret Nine	<a href="mailto:bret.nine@colvilletribes.com">bret.nine@colvilletribes.com</a>	509-999-9006
	Holly McLellan	<a href="mailto:holly.mclellan@colvilletribes.com">holly.mclellan@colvilletribes.com</a>	509-263-1081
Douglas PUD	Andrew Gingrich	<a href="mailto:andrewg@dcpud.org">andrewg@dcpud.org</a>	
	Chas Kyger	<a href="mailto:chask@dcpud.org">chask@dcpud.org</a>	509-881-2388
Grant PUD	Tom Dresser	<a href="mailto:tdresse@gcpud.org">tdresse@gcpud.org</a>	509-797-5182
NOAA	Justin Yeager	<a href="mailto:justin.yeager@noaa.gov">justin.yeager@noaa.gov</a>	509-962-8911 ext. 805
	Natasha Preston	<a href="mailto:natasha.preston@noaa.gov">natasha.preston@noaa.gov</a>	503-231-2178
USACE	Damian Walter	<a href="mailto:damian.j.walter@usace.army.mil">damian.j.walter@usace.army.mil</a>	509-527-7136
USFWS	Theresa Thom	<a href="mailto:Theresa_thom@fws.gov">Theresa_thom@fws.gov</a>	843-784-6262
WA DOE	Lizbeth Seebacher	<a href="mailto:lizbeth.seebacher@ecy.wa.gov">lizbeth.seebacher@ecy.wa.gov</a>	360-407-6938
WDFW	Allen Pleus (AIS Coordinator)	<a href="mailto:Allen.pleus@dfw.wa.gov">Allen.pleus@dfw.wa.gov</a>	360-918-3868
	Chad Jackson	<a href="mailto:chad.jackson@dfw.wa.gov">chad.jackson@dfw.wa.gov</a>	509-754-4624 ext. 250
	Chris Donley	<a href="mailto:christopher.donley@dfw.wa.gov">christopher.donley@dfw.wa.gov</a>	509-892-1001 ext. 307
	Eric Anderson, Captain (AIS Enforcement Coordinator)	<a href="mailto:eric.anderson@dfw.wa.gov">eric.anderson@dfw.wa.gov</a>	360-640-0493
	Jesse Schultz (AIS Biologist)	<a href="mailto:jesse.schultz@dfw.wa.gov">jesse.schultz@dfw.wa.gov</a>	360-480-2105
WISC <sup>2</sup>	Justin Bush	<a href="mailto:invasivespecies@rco.wa.gov">invasivespecies@rco.wa.gov</a>	360-704-0973
Yakama	Keely Murdock	<a href="mailto:murk@yakamafish-nsn.gov">murk@yakamafish-nsn.gov</a>	509-670-7880
	Michael Porter	<a href="mailto:portm@yakamafish-nsn.gov">portm@yakamafish-nsn.gov</a>	509-945-1073

Note:

1. Columbia River Inter-Tribal Fish Commission (CRITFC)
2. Washington Invasive Species Council (WISC)

### 5.3 Initial Scoping

Initial scoping activities (Figure 7) should be initiated within 7 days of a verified detection, preferably sooner. These activities include a combination of eDNA sample collection, review of fish count videos, and fish sampling for Northern Pike within preferred-type habitats (APPENDIX A). Sampling gear utilized will depend on the habitat, time of year, sampling permit stipulations, and professional knowledge of the Field Lead (Section 5.6.3).



**Figure 7. Overview of Initial Scoping Process Flow.**

#### 5.3.1 Initial Scoping Process

1. Conduct Initial Scoping eDNA Sampling
  - a. Collect 3 samples (one from each shoreline and the middle of the river) at five locations using the Responding Entity's standard protocol.
    - i. Site of detection
    - ii. 1 km upstream
    - iii. 5 km upstream
    - iv. 1 km downstream
    - v. 5 km downstream
2. Review fish count window video from previous 7 days at all count windows.
3. Conduct Northern Pike sampling in preferred-type habitat (APPENDIX A) within 10 km of detection location as permit stipulations allow (Section 5.6.3).

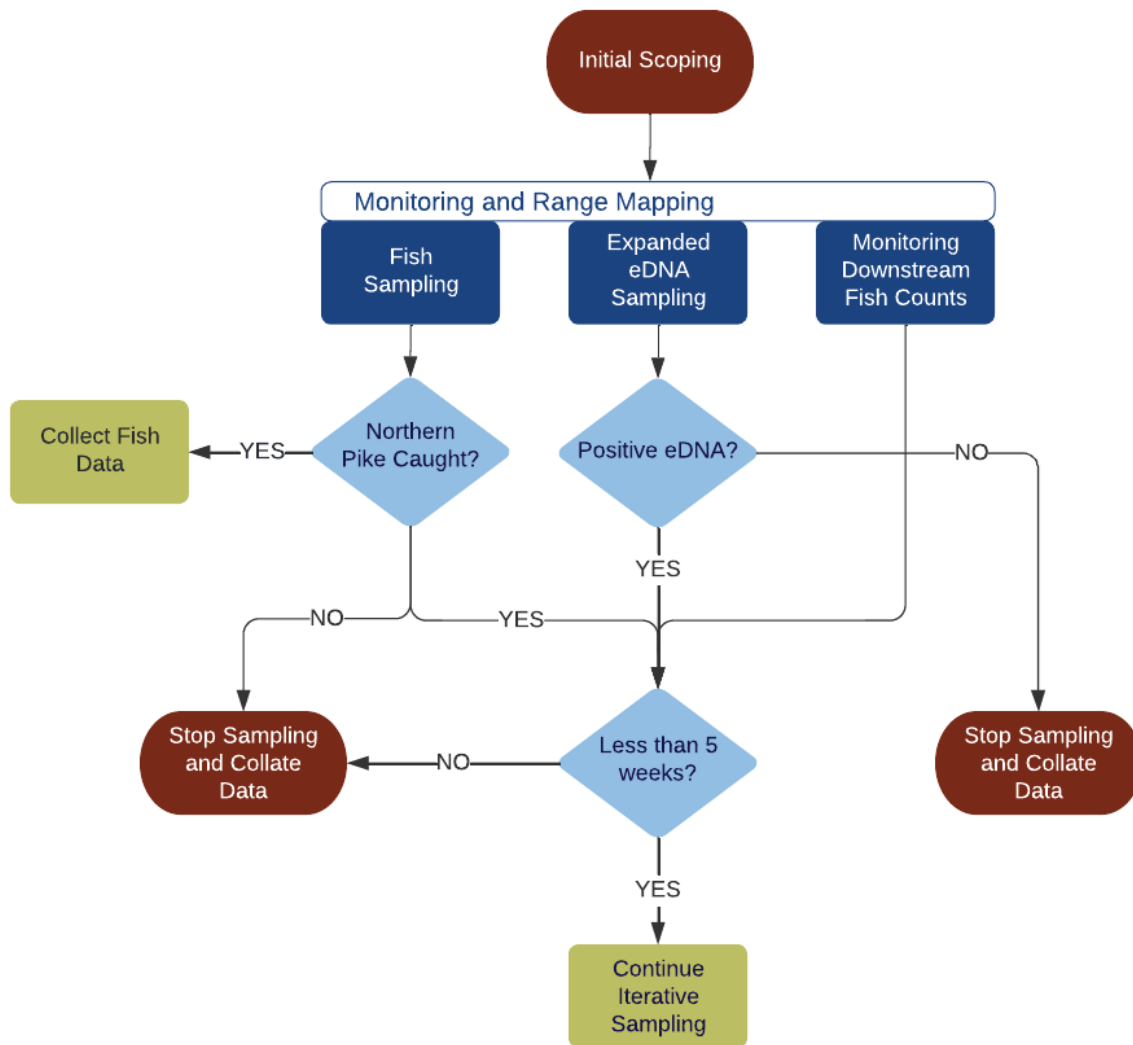
4. Contact WDFW/NMFS/USFWS, as needed, to request or confirm appropriate sampling permits or take authorizations that may be required for range delimitation activities.

### 5.3.2 *Initial Scoping Decision Tree*

- Single, Localized Detection
  - If the boundaries of the current range extent are clear after Initial Scoping, further range delimitation efforts are unnecessary. Proceed directly to data collation, dissemination, and reporting (Section 5.5).
- Multiple Detections
  - Each positive detection should be recorded as a presence location to demarcate the centroid(s) of follow-on range delimitation efforts (Section 5.4).
- No Detections
  - Re-verify and validate the data from the initial detection.
    - If the initial detection is valid, continue to range delimitation (Section 5.4).
    - If the initial detection is deemed unverified, initiate an Unverified Detection Incident Report (Section 4.3).

## 5.4 Range Delimitation

If the Initial Scoping effort results in ambiguous information about the range occupied by Northern Pike (e.g., no positive detections after a verified detection) or multiple positive detections to the outer limits where sampling was conducted, Range Delimitation efforts should be conducted (Figure 8). Range Delimitation efforts should be initiated during week 2 of Rapid Response Activities and continue, as necessary, through week 6, for a maximum of 5 weeks of sampling. This timeline provides sufficient time to garner a general understanding of the upstream and downstream limits of the current invasion and relative abundance (i.e., single fish, multiple fish, established population with confirmed reproduction) while minimizing the cost and burden to involved entities prior to the establishment of a regional monitoring, suppression, and/or eradication plan. Range Delimitation efforts may be discontinued sooner than week 6 if the upstream and downstream limits of the current invasion are determined earlier.



**Figure 8. Overview of Range Delimitation Process Flow.**

#### 5.4.1 Range Delimitation Process Flow

1. Expand eDNA sampling upstream and downstream from nearest presence point at 10 km increments until range is delimited or water boundaries are met.
2. As permits allow, expand Northern Pike sampling in preferred-type habitats (APPENDIX A) upstream and downstream from nearest presence point at no more than 10 km increments until range is delimited or water boundaries are met (Section 5.6.3). If water boundaries are met, the Responding Entity of the proximate waterbody should be contacted to conduct additional sampling (Table 1). If the proximate waterbody is outside the Plan Area, inform WDFW.
  - a. If a Northern Pike is captured, follow fish data collection protocol (Figure 5; APPENDIX C)
3. Continue daily monitoring of fish count videos for Northern Pike detections

#### 5.4.2 Range Delimitation Decision Matrix

Iteratively sample until

1. week 6 of Rapid Response Activities;
2. presence is detected throughout Plan Area (i.e., broad invasion); or
3. presence points are localized to one location (i.e., absence locations upstream and downstream bound the presence points).

## 5.5 Data Collation, Dissemination, and Reporting

Responding Entities conducting eDNA sampling, fish sampling, or review of fish count window data in association with this Plan should use the data collection worksheets in APPENDIX C. Once complete, all data collection worksheets should be provided to the Rapid Response Lead. The Rapid Response Lead will then organize and compile these data into a single-source data file that will be shared with the MAC Group and other regional stakeholders (Table 3).

## 5.6 Stakeholder Meeting

A stakeholder meeting should be convened and hosted by the Rapid Response Lead at the end of week 6 after the initiation of Rapid Response Activities. This meeting will serve two key purposes: 1) to disseminate the information collected to-date to stakeholders and 2) to begin coordinating any activities that will be conducted subsequent to the Plan (e.g., future monitoring, removal, control, or eradication efforts). Invited participants should include, at a minimum, the MAC Group and regional stakeholders listed in Table 3.

### 5.6.1 Deliverables

Prior to the meeting, relevant documentation should be distributed to the invitees. This should include:

- A map depicting sampling and detection information
- Summary of detection, verification, initial scoping, and range delimitation efforts (APPENDIX G)
  - Initial detection date
  - Dates of sampling
  - Gear used
  - Effort
  - Results of each sampling event

### 5.6.2 Agenda

The meeting agenda should cover the documentation described above and establish a general plan for next steps and subsequent communications. The following topics are recommended for the meeting agenda:

- Present the Stakeholder Meeting Data Summary Form to provide an overview of the Rapid Response effort (APPENDIX G)
- Map review to describe invasion range and relative abundance (e.g., localized fish, multiple fish with potential for reproduction, established population with confirmed reproduction)
- Public outreach information
- Future monitoring
- Roles
- Available gear and gear procurement needs
- Trained personnel and training requirements



- Funding resources
- Permit requirements
- Transition to suppression/eradication plans
- Need for an Emergency Declaration Request

### *5.6.3 After Action*

The stakeholder meeting marks the conclusion of the Rapid Response Activities covered in this Plan. It is expected that planning for additional suppression and monitoring requirements would occur in each of the areas designated ongoing work groups:

- Douglas PUD: Douglas PUD Aquatic Settlement Work Group (<https://douglaspud.org/environmental-stewardship/for-regulatory-agencies/aquatic-settlement-agreement/>)
- Chelan PUD: Rocky Reach Fish Forum (<https://www.chelanpud.org/hydropower/licensing-and-compliance/rocky-reach-license-implementation/forums/rocky-reach-fish-forum>)
- Grant PUD: Priest Rapids Coordinating Committee (<https://www.grantpud.org/resource-committes>)

## 6 Fish Sampling Guidelines

Selection of gear type for Northern Pike sampling is at the discretion of the Field Lead and is dependent on gear availability, training of personnel, physical habitat conditions, season, and available permits.

### 6.1 Sampling Gear Types for Rapid Response

This section provides a summary of habitat and permitting considerations that should be evaluated prior to fish sampling and an overview of different gear types that are likely to be implemented during Rapid Response Activities. Data collection worksheets are provided for each gear type in APPENDIX C.

#### 6.1.1 *Habitat Considerations*

While the habitats in the Plan Area vary, previous sampling suggests that water depth and bottom slope are useful predictors of where Northern Pike are likely to occur. Suppression and monitoring efforts from Lake Roosevelt capture Northern Pike at greatest efficiency in habitats with depths  $\leq 12.2$  m and slopes  $\leq 23.9^\circ$  (CTCR et al. 2018). In addition, maps developed by WDFW in 2017 (APPENDIX A) highlight those portions of the Plan Area with shallow water ( $< 4.6$  m) and low gradient bottom slopes ( $\leq 25\%$ ) which Northern Pike are likely to occupy if an invasion occurs.

#### 6.1.2 *Permitting Considerations*

For all field sampling activities, the Responding Entity is responsible for ensuring that the gear and timing of activities are authorized by the appropriate sampling permits and ESA take authorizations. This Plan does not provide any form of permit or take coverage. For fish sampling activities in the Plan Area, a scientific collection permit issued by WDFW may be required. This Plan leans heavily on the local PUDs who have familiarity with the permitting requirements in their waterbodies and already have some permits in place. For questions related to ESA take authorizations, USFWS and NMFS should be contacted.

#### 6.1.3 *Gill nets*

Gill nets are not commonly used in the Plan Area due to bycatch concerns but are the preferred method to capture adult and sub-adult Northern Pike as part of the Lake Roosevelt suppression efforts (CTCR et al. 2018). Gill net type (monofilament and multifilament), mesh size, and set duration (e.g., 4-hour short-sets vs. overnight sets) can be adjusted to improve Northern Pike capture efficiency and reduce bycatch. Suppression efforts in Lake Roosevelt suggest that multifilament gill nets with 2-inch stretch mesh maximize Northern Pike catch while minimizing bycatch; however, low densities of Northern Pike compared to non-target species may reduce the efficiency of gill netting and result in complications clearing and repairing nets. Consideration should be given to using gill nets during periods when ESA-listed species are rare or absent in the waterbody (APPENDIX H).

For Verification or Rapid Response Activities:

- It is recommended that 500 m of shoreline be sampled
- It is recommended that a multifilament or monofilament gill net with a variety of mesh sizes, including at least one panel of 2-inch stretch mesh, be used
- The net should be at least 30 x 1.8 m (100 x 6 ft)
- Northern Pike are active during the day, therefore short (4-hour) daylight sets are appropriate and will reduce bycatch of non-target fish

- For reference, deployment methods used for Northern Pike suppression in Lake Roosevelt are available in CTCR et al. 2018 and Monitoring Resources Protocol No. 3354<sup>3</sup>

#### 6.1.4 Boat Electrofishing

Boat electrofishing can be an effective tool to capture Northern Pike while minimizing bycatch mortality. Boat electrofisher settings and effort may be adjusted in real-time to minimize detrimental effects on observed non-target species in the area. Boat electrofishing can be used for all age-classes but is most effective at targeting juvenile Northern Pike. Boat electrofishing may be advantageous compared to other gear types during times of high debris loading, low visibility conditions, or high abundance of aquatic macrophytes.

For Verification or Rapid Response Activities:

- It is recommended that a 500 m sampling area be boat electrofished with 10-minute, 100-m transects
- This effort should take at least 1 hour
- For reference, the following equipment and settings are used for Northern Pike suppression in Lake Roosevelt (CTCR et al. 2018):
  - Gear: An aluminum motorized Smith-Root electrofishing boat equipped with a 5.0 Generator Powered Pulsator (GPP)
  - Deployment:
    - Boat electrofishing follows standard methodologies described in Monitoring Resources Protocol No. 3355 and in Reynolds and Lawrence (2012)
    - Electrofishing settings are standardized to 340 volts DC, 40% duty cycle, 120 pulse/sec; 3-7.5 amps, and adjusted to maximize catch of Northern Pike

#### 6.1.5 Snorkeling

Snorkeling may be an effective tool to survey shallow, non-turbid habitat for presence of Northern Pike during periods of time when mechanical sampling is restricted due to bycatch concerns. Benefits of snorkeling include limited coordination requirements (thus increasing response time), minimal impact on non-target species, an increased probability (compared to capture techniques) of observing a species at low abundance levels, and the ability to observe fish behaviors (e.g., spawning). However, there is a higher probability of misidentifying species and snorkeling does not provide the ability to measure, weigh, sex, and analyze the origin of the observed individual.

For Verification or Rapid Response Activities:

- It is recommended that the entire 500 m sampling area be snorkeled in 100 m long sections

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<sup>3</sup> Elliott Kittel. TBD. Northern Pike Juvenile Suppression v1.0. MonitoringResources.org  
<https://www.monitoringresources.org/Document/Protocol/Details/3355>

- If both stream banks cannot be observed by a single snorkeler due to stream width or physical obstructions impeding visibility, it may be necessary to have two snorkelers in adjacent lanes in the river or multiple passes be conducted
- Snorkeling should occur from downstream to upstream with an observer walking along the shoreline to record data
- Each section should take a minimum of 20 minutes to snorkel

### 6.1.6 Beach Seining

Beach seines may be an effective tool to target juvenile Northern Pike in shallow habitats during the late summer and early fall while minimizing lethal bycatch. Impacts to bycatch can be further minimized by providing coolers and battery-operated air bubblers to hold captured individuals while species are identified and sorted. Should juvenile salmonids be observed during sampling, beach seine efforts can be halted or moved to habitats where salmonids are not present.

For Verification or Rapid Response Activities:

- It is recommended that a 500 m sampling area be divided into at least five 100 m seining transects, with a minimum of three tows per transect
- A variety of seine nets may be used depending on habitat type. For reference, the following are used for suppression efforts in Lake Roosevelt (CTCR et al. 2018):
  - Seine 1:
    - Used in large bays ( $\geq 183$  m wide)
    - 91.4 x 1.83 m (300 x 6 ft)
    - ½ inch square #126 knotless nylon netting
    - Top rope is 3/8-inch braided ploy with SB-6 floats every 24 inches
    - Bottom rope is 3/8-inch braided poly with #10 leads every 12 inches
    - Breast line is 1/8-inch solid braid nylon
    - Hung using #15 twine
  - Seine 2:
    - Used in smaller bays ( $\leq 183$  m)
    - 45.7 x 1.83 m (150 x 6 ft)
    - ¼ inch square #44 knotless nylon netting
    - Top rope is 3/8 braided poly with SB-6 floats every 24 inches
    - Bottom rope is 3/8 braided poly with #10 leads every 12 inches
    - Breast line is 1/8-inch solid braid nylon
    - Hung using #15 twine
  - Beach seines are deployed following the standard methods described in Monitoring Resources Protocol No. 3355 and in Hayes et al. (1996)

### 6.1.7 Fyke Nets (or other trap/pound nets)

Fyke nets offer opportunities to target all age-classes of Northern Pike while minimizing lethal bycatch of non-target species. Fyke nets are generally deployed in shallow (< 2 m) habitat. Consideration, however,

should be given to macrophyte abundances and the likelihood of lethal bycatch of aquatic mammals (e.g., river otters, beavers) prior to deploying fyke nets.

For Verification or Rapid Response Activities:

- It is recommended that a 500 m sampling area should be divided into at least five 100 m transects
- In each transect, a minimum of one fyke net with at least 15.2 x 1.2 m deep (50 x 4 ft) leads, 1.5 m opening, and mesh size less than 6.4 mm (¼-inch) stretched should be set for one night
- Sets should follow the methods detailed in Monitoring Resources Protocol No. 3355 and Hubert (1996)
- Nets should be checked at least twice daily to minimize lethal bycatch of aquatic mammals

### *6.1.8 Baited Set lines*

Set lines are commonly used to capture Northern Pikeminnow or White Sturgeon throughout the waterbodies of interest. Set lines are typically fished over a 24- to 48-hour period and can target deeper water relative to other methods. Line weight, material, hook size, and bait can be adjusted to target Northern Pike. Rigs that have been successful for capturing Northern Pike used sizes 6, 4, 2, and 1 treble hooks, and 2/0 and 4/0 circle hooks on 30-pound steel leaders with fish bait. Some hooks were fished on the bottom, and some were suspended with floats 3 m off the bottom. While effective at capturing Northern Pike, these setups would also likely target adult salmonids. If a detection event occurs in regions with deeper water, it may be useful to consider using set lines. However, Responding Entities should be cautious to check permit limitations and time of year when considering this method.

### *6.1.9 Angling*

Angling may offer opportunities to sample key habitat during times of inclement weather, but it is not considered sufficiently robust for rapid response sampling. This method is considered a useful monitoring and potential future suppression tool.

## **6.2 Funding Considerations**

Given the short duration of this Plan, resources to support Rapid Response Activities would be provided by the Responding Entities either from funds directly related to Northern Pike management plans or other related activities (e.g., Northern Pikeminnow removal funds, eDNA budgets). Funding opportunities for permanent monitoring, suppression, and/or eradication efforts should be discussed during the stakeholder meeting concluding the Rapid Response Activities.

## 7 Public Outreach

Public outreach is a critical component of a successful invasive species prevention and response plan. The public information officer designated by the ICS should lead public outreach efforts. Typical information provided to the public regarding the nature and status of a new invasion includes:

- Information about Northern Pike
- The current understanding of its new distribution
- When it was first detected in the Plan Area
- Its likely origin, if known
- The risks it poses to local fisheries
- Potential control options in consideration
- Likelihood of success of control options
- Potential interruptions to local fisheries

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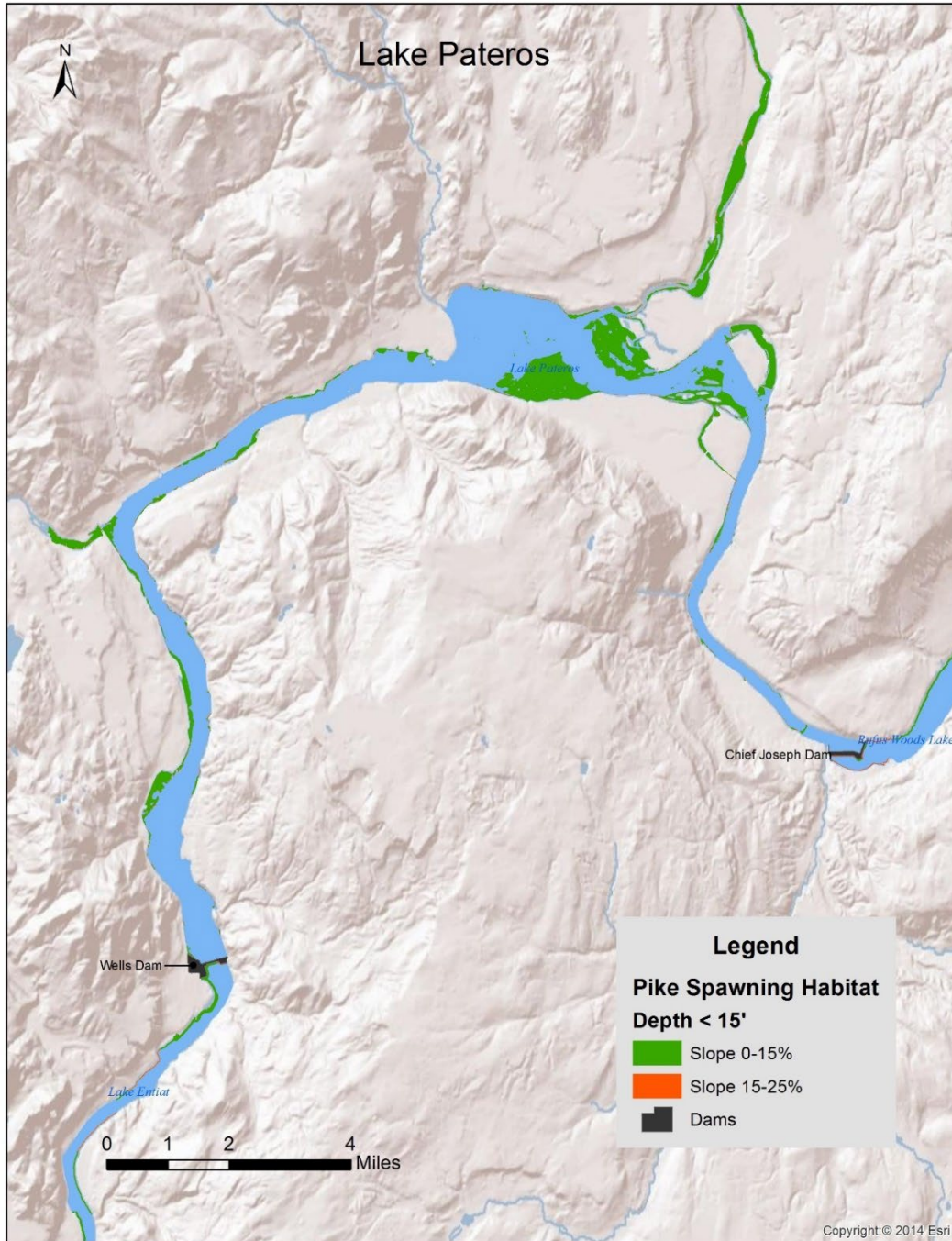
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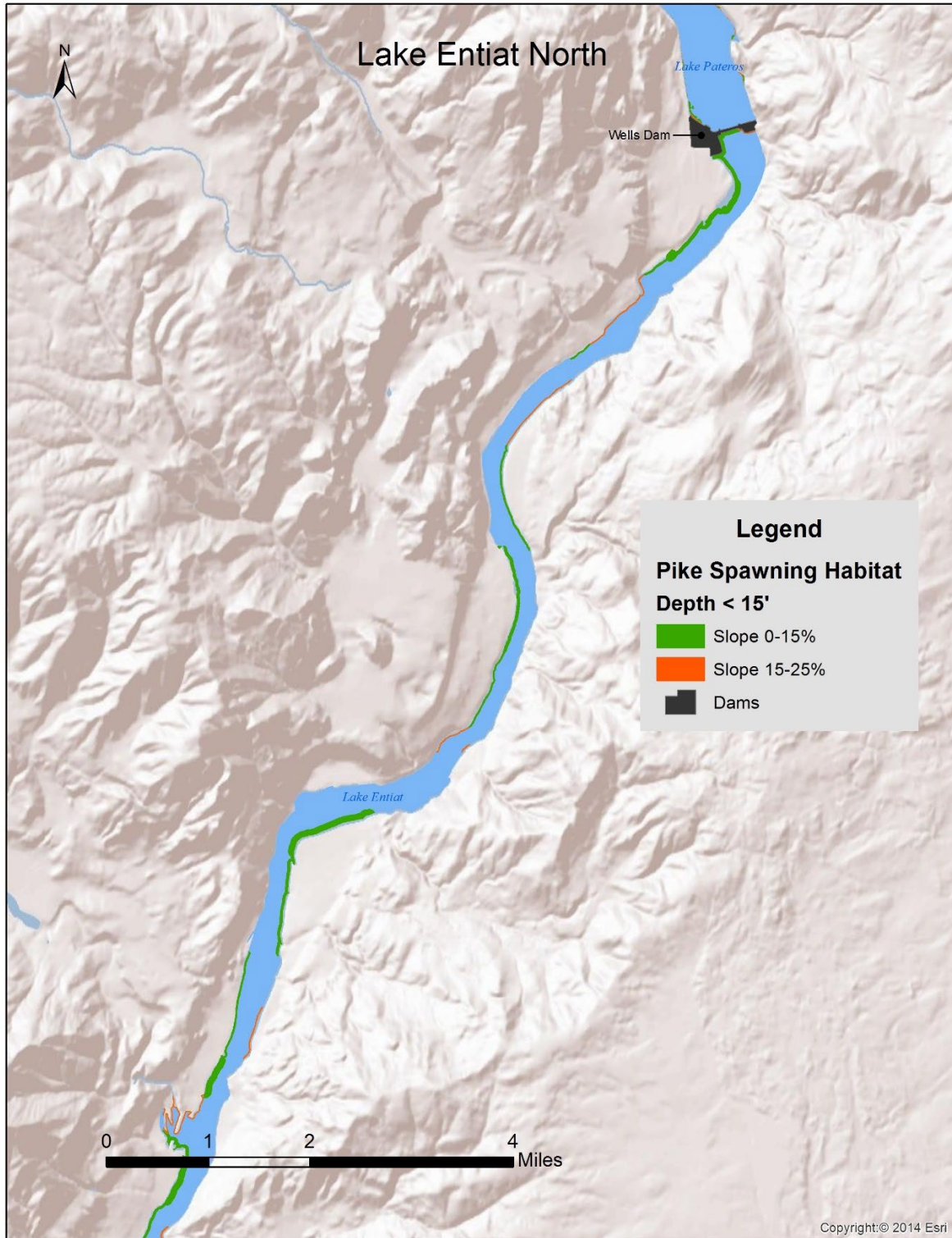
APPENDIX A Bathymetric Maps of Potential Northern Pike Spawning  
Habitat in Middle Columbia Reservoirs



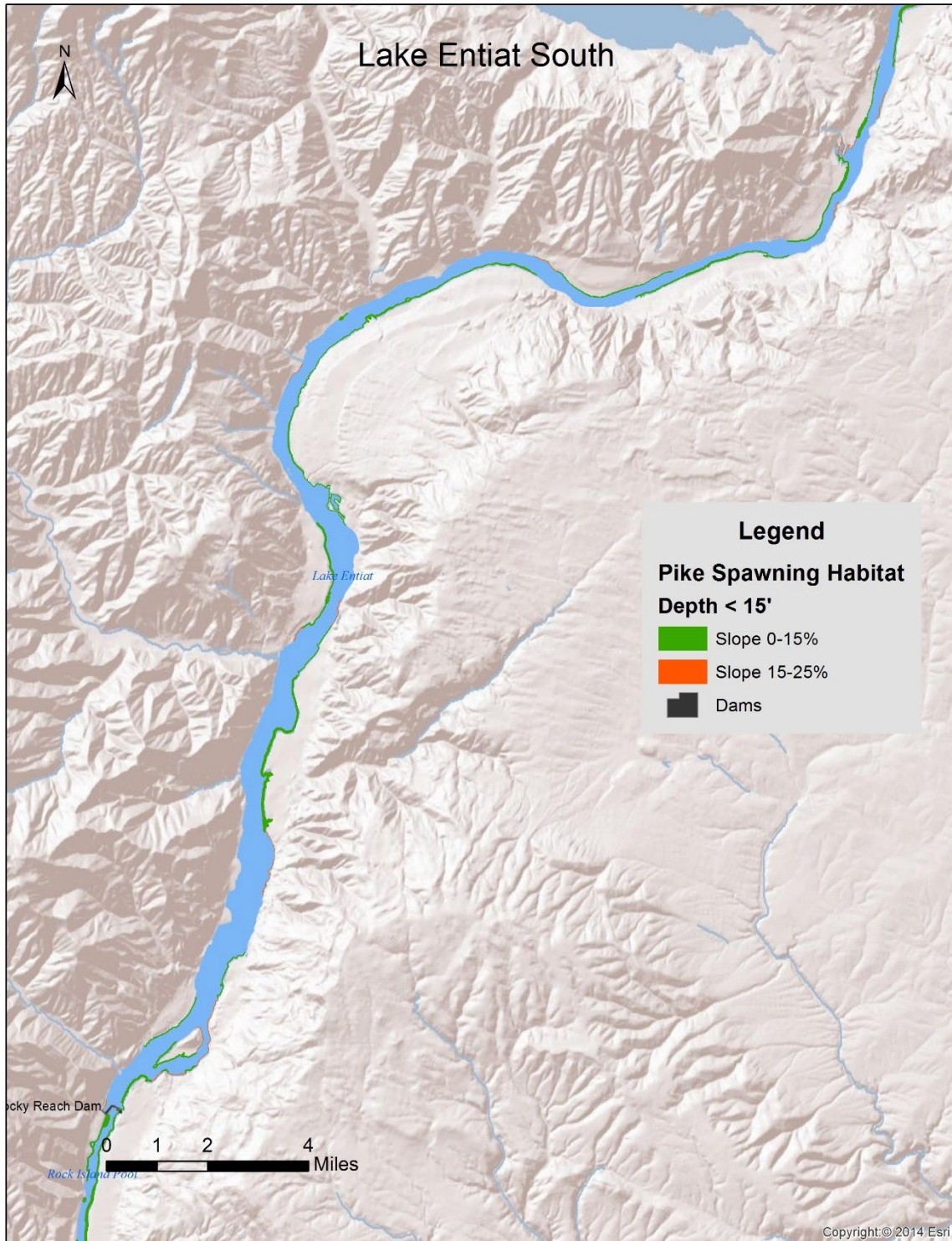
These bathymetric maps represent Northern Pike spawning habitat in the Plan Area. Spawning habitat parameters used for the estimates were depths < 4.6 m and slopes ≤ 25%. Depicted habitat are conservative estimates of preferred Northern Pike habitat which would include greater depth. All bathymetric maps were developed by Charles Lee (WDFW) in 2017 and are replicated here with permission.



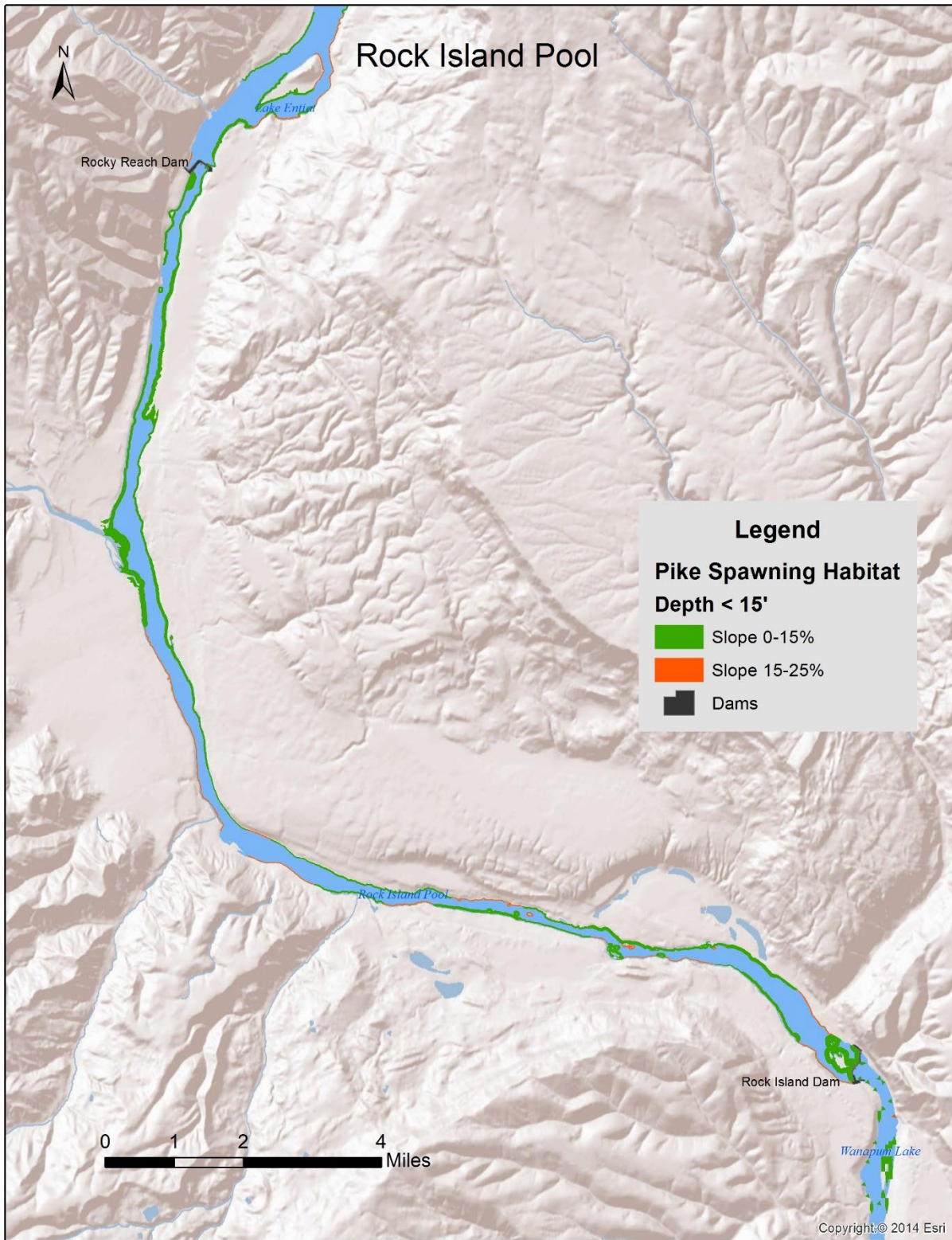
**Appendix Figure A-1. Bathymetric map of Wells reservoir, highlighting potential key habitat for Northern Pike.**



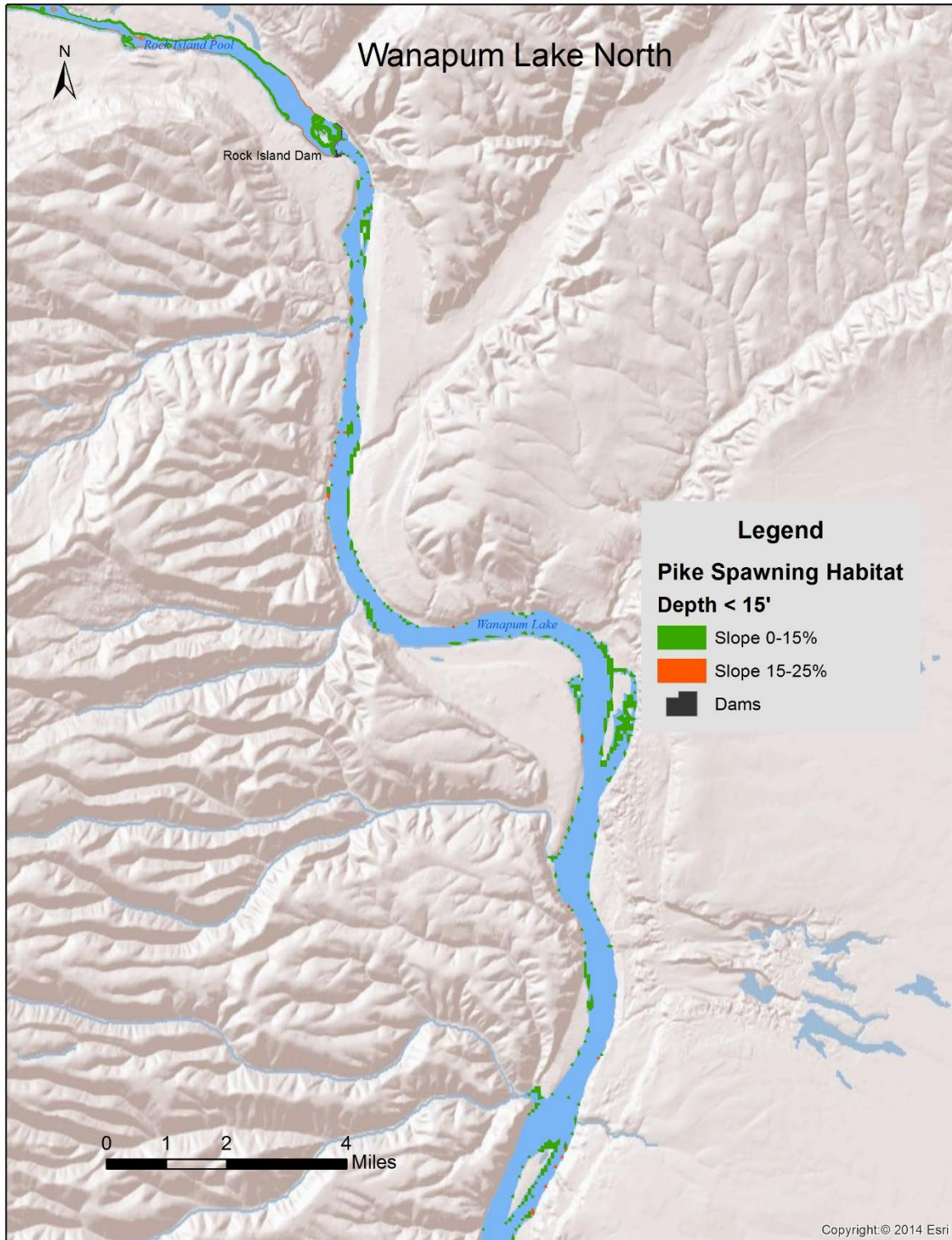
**Appendix Figure A-2. Bathymetric map of the northern portion of Rocky Reach reservoir, highlighting potential key habitat for Northern Pike.**



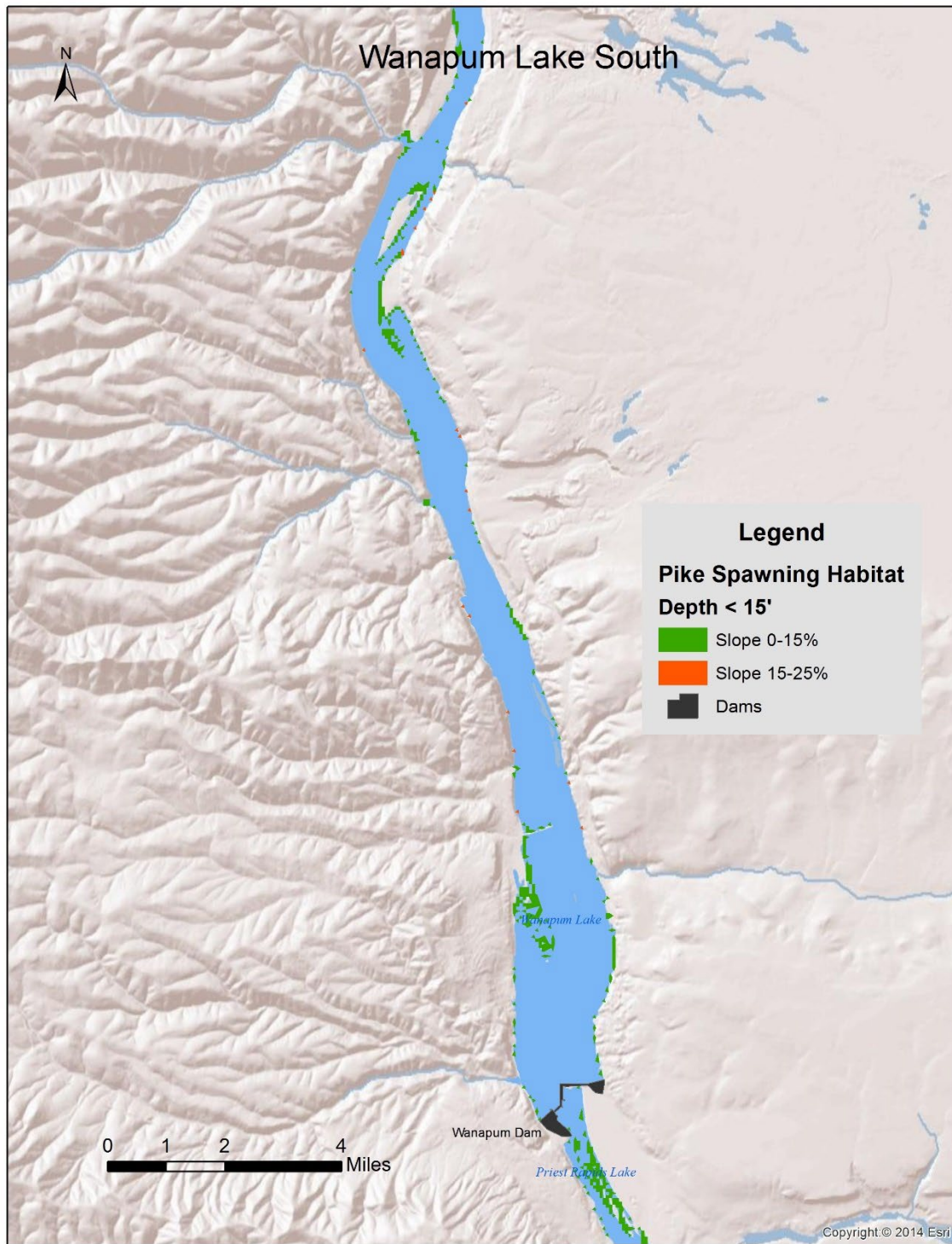
**Appendix Figure A-3. Bathymetric map of the southern portion of Rocky Reach reservoir developed by WDFW, highlighting potential key habitat for Northern Pike.**



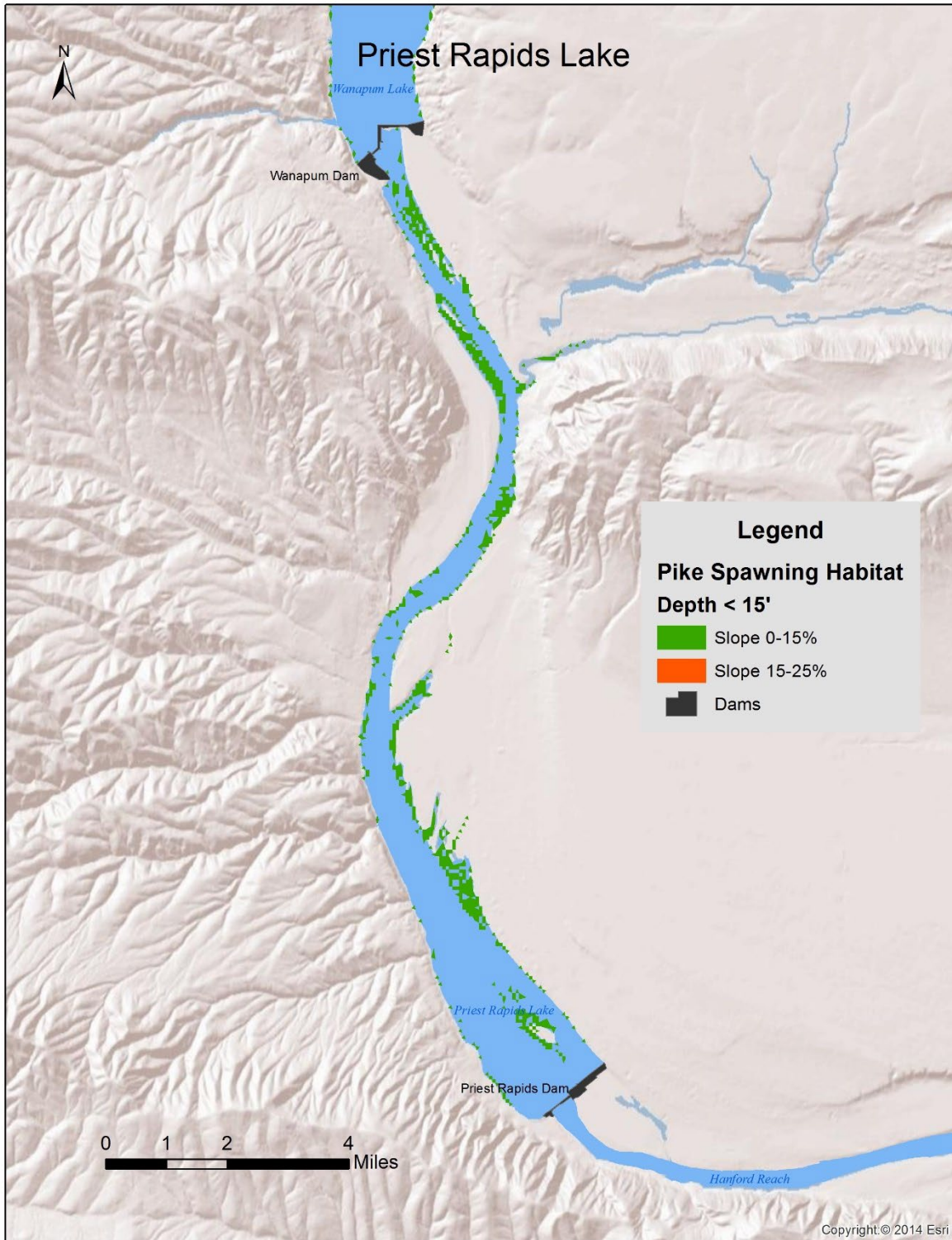
**Appendix Figure A-4. Bathymetric map of Rock Island reservoir developed by WDFW, highlighting potential key habitat for Northern Pike.**



**Appendix Figure A-5. Bathymetric map of the northern portion of Wanapum reservoir developed by WDFW, highlighting potential key habitat for Northern Pike.**



**Appendix Figure A-6. Bathymetric map of the southern portion of Wanapum reservoir developed by WDFW, highlighting potential key habitat for Northern Pike.**



**Appendix Figure A-7. Bathymetric map of Priest Rapids reservoir developed by WDFW, highlighting potential key habitat for Northern Pike.**

## APPENDIX B Environmental DNA (eDNA) Index Sites



These data represent the best-known data as of the publication of this Rapid Response Plan. Changes to these index sites should be communicated to Holly McLellan (CTCR) and Jesse Schultz (WDFW) to ensure these data remain current.

**Appendix Table B.1. List of locations where eDNA samples are collected at a minimum of an annual basis to monitor for Northern Pike.**

Entity	Waterbody	Site Name	Latitude	Longitude
CTCR	Columbia River	Rufus Woods, near Nespelem River North	48.13003	-119.04355
	Columbia River	Rufus Woods, near Nespelem River South	48.12393	-119.04322
	Columbia River	Rufus Woods, Bridgeport State Park Boat Launch	48.01430	-119.60708
	Columbia River	Rufus Woods, Willow Flats Fish Dock	47.99374	-119.62310
	Columbia River	Rufus Woods, Seatons Grove Boat Launch	48.03567	-118.97119
	Columbia River	Rufus Woods, Coyote Creek	48.14607	-119.11182
	Columbia River	Rufus Woods, Gravel Boat Launch	48.14164	-119.07202
	Columbia River	Rufus Woods, Timms' Ranch Boat Launch	48.10223	-119.32572
	Banks Lake	Inlet Osborne Campsite	47.92376	-119.06030
	Banks Lake	West Bank Ankey Boat Launch	47.62818	-119.32777
	Banks Lake	Mid Highway at Dam	47.61981	-119.30811
	Banks Lake	Steamboat Campground Bay	47.85346	-119.12748
	Banks Lake	Coulee City Boat Launch	47.61977	-119.29652
	Okanogan	Mosquito Park East Bank	48.10306	-119.70863
	Okanogan	Mosquito Park West Bank	48.10287	-119.71017
	Okanogan	Malott Bridge East Bank	48.28014	-119.70447
	Okanogan	Malott Bridge West Bank	48.28082	-119.70486
	Okanogan	Monse Bridge East Bank	48.14045	-119.67211
	Okanogan	Monse Bridge West Bank	48.14047	-119.67441
	Douglas PUD	Columbia River	Wells Pool, Washburn Island 1	48.09312
Columbia River		Wells Pool, Washburn Island 2	48.09512	-119.66765
Columbia River		Lake Pateros, Starr Ramp Upriver from Azwell (9 Right)	47.98077	-119.88876
Columbia River		Lake Pateros, across from Starr Ramp East (10 Left)	47.98147	-119.87442
Columbia River		Lake Pateros, Bridgeport Conklin Landing West (7 Left)	48.02389	-119.69213
Columbia River		Lake Pateros, Bridgeport Conklin Landing East (8 Right)	48.02418	-119.68786
Columbia River		Lake Pateros, Wells Wildlife Area Side Channel (1 East)	48.07483	-119.68604
Columbia River		Lake Pateros, Wells Wildlife Area Side Channel (2 West)	48.07532	-119.68695
Okanogan		Mosquito West (4 Right)	48.10197	-119.71122
Okanogan		Mosquito East (3 Left) Mouth HWY 97 Park	48.10252	-119.70883
Grant PUD	Okanogan	Wakefield West (5 Right)	48.20743	-119.71259
	Okanogan	Wakefield East (6 Left)	48.20816	-119.71244
	Columbia River	Priest Rapids Lake, Buckshot Wildlife Area	46.71180	-119.95320
	Columbia River	Priest Rapids Lake, Crab Creek Mouth	46.81510	-119.92270
	Columbia River	Wanapum Lake, Crescent Bar Marina	47.21516	-119.99401
WDFW	Columbia River	Wanapum Lake, Sunland Estates Ramp	47.06890	-120.02570
	Columbia River	Wanapum Lake, Wanapum State Park	46.90540	-119.98770
WDFW	Banks Lake	Ankeny Ramp #1	47.62820	-119.32765
	Banks Lake	Ankeny Ramp #2	47.64045	-119.32169

Banks Lake	Coulee City Marina	47.61714	-119.29415
Banks Lake	Coulee Playland/Electric City	47.93590	-119.03090
Banks Lake	Steamboat Rock State Park #1 Main	47.86331	-119.11810
Banks Lake	Steamboat Rock State Park #2 Northrop	47.87233	-119.09833
Banks Lake	Steamboat Rock State Park #3 Osborne	47.92350	-119.06030
Banks Lake	Osborne Bay Ramp	47.91750	-119.05320
Banks Lake	Sunbanks Resort	47.92630	-119.05780
Conconully	Conconully Lake State Park Ramp	48.56424	-119.73050
Conconully	Liar's Cove Resort	48.54909	-119.74776
Lake Chelan	25 Mile Creek State Park	47.99376	-120.26177
Lake Chelan	Old Mill Park (Manson)	47.87746	-120.12842
Lake Chelan	Chelan River Park	47.83510	-120.01420
Lake Chelan	Lakeshore Marina	47.84138	-120.02515
Lake Chelan	Lake Chelan State Park	47.87521	-120.19614
Lake Chelan	Sunset Marina public dock between two private co. that have boat ramps	47.83689	-120.03633
Lake Chelan	Lake Chelan Yacht Club	47.92004	-120.20904
Lake Chelan	Cove Marina	47.90825	-120.21537
Columbia River	Lake Entiat, Lincoln Rock State Park	47.54041	-120.28048
Columbia River	Lake Entiat, Orondo River Park	47.65681	-120.21651
Columbia River	Lake Entiat, Chelan Falls Park	47.79708	-119.98483
Columbia River	Lake Entiat, Entiat City Park	47.66572	-120.21935
Columbia River	Lake Entiat, Ramp across from Entiat City Park	47.66530	-120.20780
Columbia River	Lake Entiat, Beebe Bridge Park	47.80817	-119.97440
Columbia River	Lake Entiat, Daroga State Park	47.71135	-120.20863
Columbia River	Lake Pateros, Pateros City Park	48.05510	-119.89560
Columbia River	Lake Pateros, Brewster Columbia Cove Park	48.09023	-119.78617
Columbia River	Lake Pateros, Bridgeport Marina Park	48.01480	-119.67810
Columbia River	Lake Pateros, Conklin Landing Ramp	48.01850	-119.68560
Columbia River	Lake Pateros, Chicken Creek Ramp	48.09390	-119.66800
Columbia River	Priest Rapids Lake, Buckshot Wildlife Area	46.71180	-119.95320
Columbia River	Priest Rapids Lake, Crab Creek Mouth	46.81510	-119.92270
Columbia River	Priest Rapids Lake, Lake Geneva Middle	46.73770	-119.96580
Columbia River	Priest Rapids Lake, Desert Air Park	46.68360	-119.93270
Columbia River	Priest Rapids Lake, Wanapum Tailrace Ramp	46.86440	-119.96790
Columbia River	Priest Rapids Lake, Priest Rapids Forebay Ramp	46.64330	-119.92540
Moses Lake	Montlake Park	47.10860	-119.28500
Moses Lake	Cascade Valley Park	47.13630	-119.31850
Moses Lake	Lower Peninsula Park	47.09051	-119.31079
Moses Lake	Blue Heron Park	47.10670	-119.32720
Moses Lake	Pier 4 Sunrise Resort	47.10137	-119.32538
Moses Lake	WDFW Ramp North	47.22954	-119.42899
Moses Lake	Connelly Park	47.18621	-119.34992
Osoyoos Lake	Veterans Memorial Park	48.94963	-119.43008

	Osoyoos Lake	Deep Bay Park	48.96429	-119.44185
	Potholes	Potholes State Park	46.98136	-119.34732
	Potholes	Mar Don Resort	46.96760	-119.32010
	Potholes	Glenn Williams Ramp	46.98360	-119.25626
	Potholes	Blythe Ramp	46.96961	-119.33255
	Potholes	Lind Coulee West Bridge Ramp	46.98895	-119.21038
	Columbia River	Rock Island Lake, Wenatchee Riverfront Park	47.42506	-120.30569
	Columbia River	Rock Island Lake, South Wenatchee/Kirby Billingsley	47.38751	-120.26607
	Columbia River	Rock Island Lake, Wenatchee Confluence State Park	47.46231	-120.32155
	Columbia River	Rufus Woods, Bridgeport State Park	48.01410	-119.60720
	Columbia River	Rufus Woods, Seatons Grove Ramp	48.03580	-118.97150
	Columbia River	Wanapum Lake, Vantage Ramp	46.94125	-119.98392
	Columbia River	Wanapum Lake, Quilomene Yacht Club	47.06890	-120.03160
	Columbia River	Wanapum Lake, Crescent Bar Marina	47.21516	-119.99401
	Columbia River	Wanapum Lake, Sunland Estates Ramp	47.06890	-120.02570
	Columbia River	Wanapum Lake, Wanapum Forebay Ramp	46.88290	-119.95680
	Columbia River	Wanapum Lake, Vantage Docks	46.94190	-119.98398
	Columbia River	Wanapum Lake, Wanapum State Park	46.90540	-119.98770

## APPENDIX C      Rapid Response Data Collection Worksheets





<b>Northern Pike: Gill Nets</b>	Page ___ of ___
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Site ID:	Initial Detection Location:	Location relative to last positive detection (circle one):
Date (MM/DD/YYYY):		
Time (Military):	Initial Detection Date (MM/DD/YYYY):	Upstream / Downstream

Waterbody:	Start Lat (XX.XXXX):	Start Long (XXX.XXXX):
Agency:	End Lat (XX.XXXX)	End Long (XXX.XXXX):

Water Temp (°C):	Crew:	
Number of Nets:	Data Recorder:	

Comments:

Gill Net Details							
Net #	Set Time (Military)	Pull Time (Military)	Net Type (Mono/Multi)	Net Dimensions LxH (m)	Mesh Size(s) (mm)	Net Depth	
						Min (m)	Max (m)

Catch Details				
Species ID	Fin Clips (Y/N)	Tagged? (PIT, floy, acoustic)	Tag ID	Comments

BBH	Brown Bullhead	COHO	Coho Salmon	LND	Longnose Dace	PMO	Peamouth	TNC	Tench
BC	Black Crappie	COT	Sculpin Spp.	LNS	Longnose Sucker	PS	Pumpkinseed	TT	Tiger Trout
BLC	Bull Trout	CP	Carp	LRs	Largescale Sucker	RBT	Rainbow Trout-all	WAL	Walleye
BRS	Bridgelip Sucker	CT	Cutthroat Trout	LT	Lake Trout	RS	Redside Shiner	WF	Mountain Whitefish
BT	Brown Trout	EB	E Brook Trout	LW	Lake Whitefish	SMB	Smallmouth Bass	WS	White Sturgeon
BUR	Burbot	GS	Green Sunfish	NP	Northern Pike	SOCK	Sockeye	YP	Yellow Perch
CK	Chinook Salmon	K	Kokanee	NPM	Northern Pikeminnow	SPD	Speckled Dace		
CMO	Chiselmouth	LMB	Largemouth Bass	PL	Pacific Lamprey	STH	Steelhead		

<b>Northern Pike: Boat/Backpack Electrofishing (circle one)</b>	Page ___ of ___
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Site ID:	Initial Detection Location:	Location relative to last positive detection (circle one): Upstream / Downstream
Date (MM/DD/YYYY):		
Time (Military):	Initial Detection Date (MM/DD/YYYY):	

Waterbody:	Start Lat (XX.XXXX):	Start Long (XXX.XXXX):	Crew:
Agency:	End Lat (XX.XXXX):	End Long (XXX.XXXX):	Data Recorder:
Transect #:	Weather:		Efish Time (sec):

Water Temp (°C):	Pulses:	Volts:
Conductivity:	Duty Cycle:	Amps:

Comments:

Catch Details				
Species ID	Fin Clips (Y/N)	Tagged? (PIT, floy, acoustic)	Tag ID	Comments

BBH	Brown Bullhead	COHO	Coho Salmon	LND	Longnose Dace	PMO	Peamouth	TNC	Tench
BC	Black Crappie	COT	Sculpin Spp.	LNS	Longnose Sucker	PS	Pumpkinseed	TT	Tiger Trout
BLC	Bull Trout	CP	Carp	LRS	Largescale Sucker	RBT	Rainbow Trout-all	WAL	Walleye
BRS	Bridgelip Sucker	CT	Cutthroat Trout	LT	Lake Trout	RS	Redside Shiner	WF	Mountain Whitefish
BT	Brown Trout	EB	E Brook Trout	LW	Lake Whitefish	SMB	Smallmouth Bass	WS	White Sturgeon
BUR	Burbot	GS	Green Sunfish	NP	Northern Pike	SOCK	Sockeye	YP	Yellow Perch
CK	Chinook Salmon	K	Kokanee	NPM	Northern Pikeminnow	SPD	Speckled Dace		
CMO	Chiselmouth	LMB	Largemouth Bass	PL	Pacific Lamprey	STH	Steelhead		



<b>Northern Pike: Snorkel Survey</b>	Page ___ of ___
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Site ID:	Initial Detection Location:	Location relative to last positive detection (circle one):  Upstream / Downstream
Date (MM/DD/YYYY):		
Time (Military):	Initial Detection Date (MM/DD/YYYY):	

Waterbody:	Weather:	Snorkelers(s):
Agency:	Water Temp (°C):	Data Recorder:

Visibility (m):	Snorkeling Method:
Section length (m):	

Start Time:	Start Lat (XX.XXXX):	Start Long (XXX.XXXX):
End Time:	End Lat (XX.XXXX):	End Long (XXX.XXXX):

Comments:

Species ID	Count	Habitat Type	Substrate	Vegetation Type	Notes

BBH	Brown Bullhead	COHO	Coho Salmon	LND	Longnose Dace	PMO	Peamouth	TNC	Tench
BC	Black Crappie	COT	Sculpin Spp.	LNS	Longnose Sucker	PS	Pumpkinseed	TT	Tiger Trout
BLC	Bull Trout	CP	Carp	LRN	Largemouth Sucker	RBT	Rainbow Trout-all	WAL	Walleye
BRS	Bridgelip Sucker	CT	Cutthroat Trout	LT	Lake Trout	RS	Redside Shiner	WF	Mountain Whitefish
BT	Brown Trout	EB	E Brook Trout	LW	Lake Whitefish	SMB	Smallmouth Bass	WS	White Sturgeon
BUR	Burbot	GS	Green Sunfish	NP	Northern Pike	SOCK	Sockeye	YP	Yellow Perch
CK	Chinook Salmon	K	Kokanee	NPM	Northern Pikeminnow	SPD	Speckled Dace		
CMO	Chiselmouth	LMB	Largemouth Bass	PL	Pacific Lamprey	STH	Steelhead		

Northern Pike: Beach Seining		Page ___ of ___
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Site ID:	Initial Detection Location:	Location relative to last positive detection (circle one):  Upstream / Downstream
Date (MM/DD/YYYY):		
Time (Military):	Initial Detection Date (MM/DD/YYYY):	

Waterbody:	Start Lat (XX.XXXX):	End Lat (XX.XXXX):
Agency:	Start Long (XXX.XXXX):	End Long (XXX.XXXX):

Water Temp (°C):	Crew:
Max Depth:	Data Recorder:

Number of Tows:	Transect length (m):	Seine height (m):
Water depth (m):	Seine mesh size (mm):	Seine width (m):

Comments:
-----------

Catch Details				
Species ID	Fin Clips (Y/N)	Tagged? (PIT, floy, acoustic)	Tag ID	Comments

BBH	Brown Bullhead	COHO	Coho Salmon	LND	Longnose Dace	PMO	Peamouth	TNC	Tench
BC	Black Crappie	COT	Sculpin Spp.	LNS	Longnose Sucker	PS	Pumpkinseed	TT	Tiger Trout
BLC	Bull Trout	CP	Carp	LRN	Largescale Sucker	RBT	Rainbow Trout-all	WAL	Walleye
BRS	Bridgelip Sucker	CT	Cutthroat Trout	LT	Lake Trout	RS	Redside Shiner	WF	Mountain Whitefish
BT	Brown Trout	EB	E Brook Trout	LW	Lake Whitefish	SMB	Smallmouth Bass	WS	White Sturgeon
BUR	Burbot	GS	Green Sunfish	NP	Northern Pike	SOCK	Sockeye	YP	Yellow Perch
CK	Chinook Salmon	K	Kokanee	NPM	Northern Pikeminnow	SPD	Speckled Dace		
CMO	Chiselmouth	LMB	Largemouth Bass	PL	Pacific Lamprey	STH	Steelhead		

<b>Northern Pike: Fyke Nets</b>	Page ___ of ___
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Site ID:	Initial Detection Location:	Location relative to last positive detection (circle one):  Upstream / Downstream
Date (MM/DD/YYYY):	Initial Detection Date (MM/DD/YYYY):	
Time (Military):		

Waterbody:	Start Lat (XX.XXXX):	End Lat (XX.XXXX)
Agency:	Start Long (XXX.XXXX):	End Long (XXX.XXXX):

Water Temp (°C):	Crew:
Number of Traps:	Data Recorder:

Comments:

Fyke Net Details					
Trap #	Deployment Time (Military)	Retrieval Time (Military)	Net Dimensions LxWxH (m)	Mesh Size(s) (mm)	Set Depth (m)

Catch Details				
Species ID	Fin Clips (Y/N)	Tagged? (PIT, floy, acoustic)	Tag ID	Comments

BBH	Brown Bullhead	COHO	Coho Salmon	LND	Longnose Dace	PMO	Peamouth	TNC	Tench
BC	Black Crappie	COT	Sculpin Spp.	LNS	Longnose Sucker	PS	Pumpkinseed	TT	Tiger Trout
BLC	Bull Trout	CP	Carp	LRs	Largescale Sucker	RBT	Rainbow Trout-all	WAL	Walleye
BRS	Bridgelip Sucker	CT	Cutthroat Trout	LT	Lake Trout	RS	Redside Shiner	WF	Mountain Whitefish
BT	Brown Trout	EB	E Brook Trout	LW	Lake Whitefish	SMB	Smallmouth Bass	WS	White Sturgeon
BUR	Burbot	GS	Green Sunfish	NP	Northern Pike	SOCK	Sockeye	YP	Yellow Perch
CK	Chinook Salmon	K	Kokanee	NPM	Northern Pikeminnow	SPD	Speckled Dace		
CMO	Chiselmouth	LMB	Largemouth Bass	PL	Pacific Lamprey	STH	Steelhead		

<b>Northern Pike: Baited Set lines</b>	Page ___ of ___
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Site ID:	Initial Detection Location:	Location relative to last positive detection (circle one):  Upstream / Downstream
Date (MM/DD/YYYY):	Initial Detection Date (MM/DD/YYYY):	
Time (Military):		

Waterbody:	Start Lat (XX.XXXX):	End Lat (XX.XXXX):	Crew:
Agency:	Start Long (XXX.XXXX):	End Long (XXX.XXXX):	Data Recorder:

Water Temp (°C):	Deployment Time (Military):	Bait Type:
Weather:	Retrieval Time (Military):	

Line Weight:	Number of Hooks:	Hook Suspension Location:
Line Material:	Hook Type:	
Ganoin Length:	Hook Size(s):	

Comments:

Catch Details									
Species ID	Fin Clips (Y/N)	Tagged? (PIT, floy, acoustic)	Tag ID	Comments					
BBH	Brown Bullhead	COHO	Coho Salmon	LND	Longnose Dace	PMO	Peamouth	TNC	Tench
BC	Black Crappie	COT	Sculpin Spp.	LNS	Longnose Sucker	PS	Pumpkinseed	TT	Tiger Trout
BLC	Bull Trout	CP	Carp	LRs	Largescale Sucker	RBT	Rainbow Trout-all	WAL	Walleye
BRS	Bridgelip Sucker	CT	Cutthroat Trout	LT	Lake Trout	RS	Redside Shiner	WF	Mountain Whitefish
BT	Brown Trout	EB	E Brook Trout	LW	Lake Whitefish	SMB	Smallmouth Bass	WS	White Sturgeon
BUR	Burbot	GS	Green Sunfish	NP	Northern Pike	SOCK	Sockeye	YP	Yellow Perch
CK	Chinook Salmon	K	Kokanee	NPM	Northern Pikeminnow	SPD	Speckled Dace		
CMO	Chiselmouth	LMB	Largemouth Bass	PL	Pacific Lamprey	STH	Steelhead		



## APPENDIX D Northern Pike Taxonomic Keying Characteristics

## Northern Pike Taxonomic Keying Characteristics

Northern Pike *Esox lucius* can be readily identified by examining anatomical features (morphological and meristic characteristics) and coloration patterns. For the purpose of the Northern Pike Rapid Response Plan, an abbreviated list of distinguishing characteristics has been assembled to differentiate Northern Pike from 1) common Columbia River species that are frequently misidentified as Northern Pike and 2) other members of the pike family (Esocidae) that are less common but closely resemble Northern Pike in appearance. The use of a regional dichotomous key is recommended for definitive identification and information from Scholz and McLellan (2009) has been relied upon here.

### Identification Process

The identification process and information presented here assume that the individual making the identification has a general understanding of fish anatomy and can preliminarily rule out species that differ greatly in appearance and anatomy from Northern Pike. The identification process focuses first on anatomical characteristics that quickly distinguish Northern Pike from other common Columbia River species and then focuses on anatomical characteristics that distinguish Northern Pike from other members of the pike family (Esocidae).

#### Step 1. Distinguishing Northern Pike from Common Columbia River Species

Northern Pike are superficially similar in appearance to several fish species that are commonly found in the Columbia River. These other species include Northern Pikeminnow (*Ptychocheilus oregonensis*) and Walleye (*Sander vitreus*) and are frequently misidentified as Northern Pike. Northern Pikeminnow and Walleye can be easily distinguished from Northern Pike (and all members of Esocidae) based on dorsal fin number and morphology, relative location of dorsal and pelvic fins, dentition, and snout length relative to lower jaw length (Appendix Figure D-1).

#### Step 2. Distinguishing Northern Pike from other Members of Esocidae

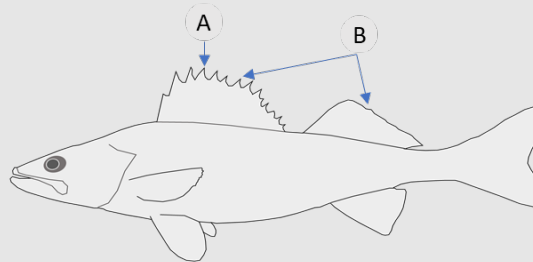
Redfin Pickerel and Tiger Muskellunge are found in habitats that are adjacent to or potentially drain into the Rapid Response Plan Area and should therefore be considered when identifying a putative Northern Pike. Moreover, these species closely resemble Northern Pike in body form and general appearance. Adults of each species may be differentiated from one another based on external coloration patterns (Appendix Figure D-2). However, juvenile Northern Pike closely resemble the coloration patterns of Tiger Muskellunge and should be definitively identified using meristic branchiostegal counts (Scholz and McLellan 2009).

### Distinguishing Northern Pike from Common Columbia River Species

#### Walleye



Photo Source: Scholz and McLellan (2009)



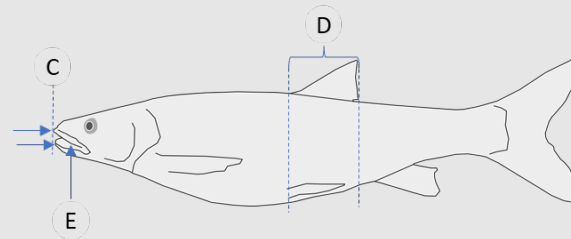
**Walleye distinguishing characteristics:**

- A. Prominent spines on the anterior dorsal fin (Northern Pike fins are all soft-rayed without spines)
- B. The presence of two distinct dorsal fins (Northern Pike have one dorsal fin)

#### Northern Pikeminnow



Photo Source: Scholz and McLellan (2009)



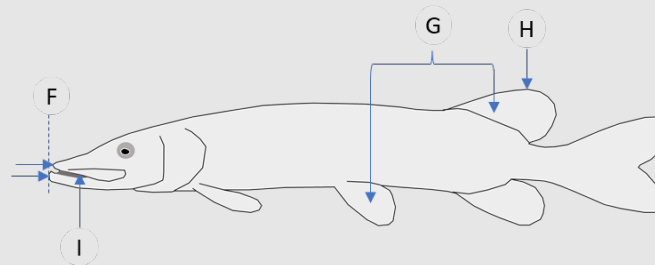
**Northern Pikeminnow distinguishing characteristics:**

- C. The tip of the snout may extend past the lower jaw (the lower jaw of a Northern Pike extends well past the tip of the snout)
- D. The dorsal fin and pelvic fins vertically overlap and are located near the midpoint of the body (The dorsal fin of a Northern Pike is posterior to the pelvic fin and the two fins do not overlap)
- E. Toothless mouth (Northern Pike have large visible teeth)

#### Northern Pike



Photo Source: USFWS National Digital Library



**Northern Pike/Esocidae distinguishing characteristics:**

- F. The lower jaw clearly extends past the tip of the snout (distinguishes from Northern Pikeminnow)
- G. The dorsal fin is located near the caudal fin and is posterior to the pelvic fins (distinguishes from Northern Pikeminnow)
- H. Single dorsal fin with no spines (distinguishes from Walleye and other perches)
- I. Large teeth easily visible on jaws (distinguishes from Northern Pikeminnow)

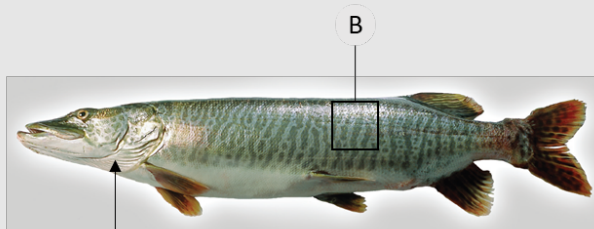
Appendix Figure D-1. Distinguishing anatomical characteristics used to differentiate between Northern Pike and other common Columbia River species that are frequently misidentified as Northern Pike. Distinguishing characteristics are adapted from Scholz and McLellan (2009).



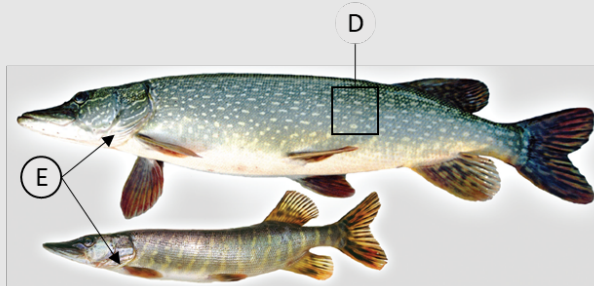
## Distinguishing Northern Pike from other Members of Esocidae

Redfin  
Pickerel*Photo Source: Scholz and McLellan (2009)***Redfin Pickerel distinguishing characteristics:**

- A. Prominent vertical black bar below the eye and horizontal black bars in front and behind the eye (Northern Pike lack these markings)

Tiger  
Muskellunge*Photo Source: Scholz and McLellan (2009)***Tiger Muskellunge distinguishing characteristics:**

- B. Coloration pattern includes alternating wavy, dark and light bands that resemble tiger stripes (adult Northern Pike do not have stripes and instead have oblong white spots that are oriented in horizontal rows)
- C. Nine branchiostegal rays arising on epiphyal (Northern Pike have eight or fewer)

Northern  
Pike  
(adult and  
juvenile)*Photo Source: Scholz and McLellan (2009)***Northern Pike distinguishing characteristics:**

- D. Adult coloration pattern includes oblong white spots on dark background. White spots may appear in horizontal rows. NOTE: juvenile Northern Pike have light bars on dark background resembling Tiger Muskellunge.
- E. Eight or fewer branchiostegal rays arising on epiphyal (Tiger Muskellunge have nine)

**Appendix Figure D-2. Distinguishing anatomical characteristics used to differentiate between Northern Pike and other members of the Esocidae family that may occur in the Rapid Response Plan area. Distinguishing characteristics are adapted from Scholz and McLellan (2009).**

APPENDIX E Initial Notification Template

Date

**RE: Notification of Verified Northern Pike Detection**

Dear Stakeholder,

This letter is to notify you that there has been a verified detection of a Northern Pike *Esox lucius* downstream of Grand Coulee Dam. The first detection occurred on Date, detected via Select Observation Method. The detection was verified by Select Sampling Method on Date by Entity. As a result, a Rapid Response effort is being initiated by Entity. RR\_FirstName RR\_LastName will be designated as the Rapid Response Lead (PhoneNumber, EmailAddress). FL\_FirstName FL\_LastName will be designated as the Field Lead for sampling efforts conducted in Waterbody (PhoneNumber, EmailAddress). Initial scoping efforts are planned to begin Date. The Rapid Response efforts will be completed no later than 6 weeks from today, Date, and will culminate in a meeting to discuss next steps. Should Northern Pike detections occur in other waterbodies designated in the Northern Pike Rapid Response Plan for the Columbia River between Priest Rapids Dam and Chief Joseph Dam or the Okanogan River during the next 6-weeks, please contact me to coordinate our response. I will be in touch with progress reports throughout the process.

Sincerely,

YourName

Title

## APPENDIX F      Public Outreach Signs



Appendix Figure F-1. Example public outreach sign provided by Washington Invasive Species Council.

# STOP THE SPREAD OF INVASIVE NORTHERN PIKE



This site is at risk for invasion by Northern Pike. Northern Pike pose a significant threat to Oregon and Washington salmon and steelhead.

**IF CAUGHT DO NOT RELEASE.**

Photograph and report to your State  
Department of Fish and Wildlife.

**Washington Reports**

1-360-902-2700  
fishpgm@dfw.wa.gov  
invasivespecies.wa.gov

**Oregon Reports**

1-866-INVADER  
Invasive.Species@state.or.us  
oregoninvasiveshotline.org

1-800-433-3344



VENUE GROUP, LLC, BAHAMAS, NY 13101-8033 1-800-433-3344 www.VenueGroup.com

Appendix Figure F-2. Example public outreach sign provided by Washington Invasive Species Council.

# Protect Your Waters From Aquatic Invasive Species

## BEFORE and AFTER launching boat

### CLEAN

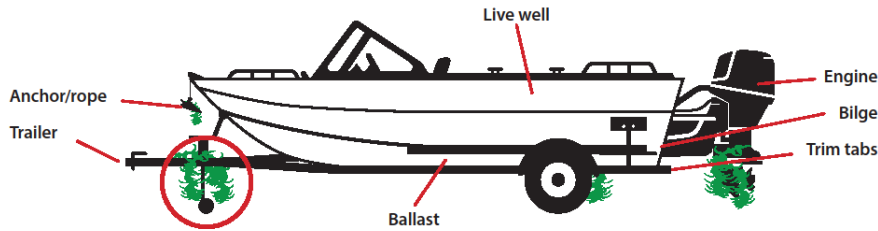
Clean interior/exterior of boat, trailer, & vehicle of any organic matter such as aquatic plants & mud. Dispose organic matter & unused bait in trash.

### DRAIN

Drain bilge, ballast, wells & buckets before you leave area. Keep bilge plug out during transport.

### DRY

Dry equipment before launching watercraft into another body of water.



For information on FREE boat inspections, call 1-888-WDFW-AIS (933-9247) or visit [wdfw.wa.gov/ais](http://wdfw.wa.gov/ais).

**Before you launch a boat that is not registered in Washington, you MUST purchase an Aquatic Invasive Species Prevention Permit.**

#### How to buy:

- Online at [fishhunt.dfw.wa.gov](http://fishhunt.dfw.wa.gov)
- Find a license dealer near you at [wdfw.wa.gov/licenses/dealers](http://wdfw.wa.gov/licenses/dealers)

Funds from permit sales supports efforts to keep Washington's waters free of aquatic invasive species and manage infestations when prevention fails.

#### Avoid Citations or Fines

Failure to possess an Aquatic Invasive Species Prevention Permit – Infraction — RCW 77.15.160  
 Possession of aquatic conveyance not meeting clean drain requirements – Infraction — RCW 77.135.110  
 Introduction or possession of prohibited species – up to class C felony — RCW 77.15.160 (4)



Washington  
Department of  
**FISH and  
WILDLIFE**



Appendix Figure F-3. Example sign posted at boat launches.

## THE PROBLEM

### Background

Northern pike are illegally introduced, highly invasive predators in the Columbia River. These voracious fish feed on juvenile salmon and are currently spreading downstream, threatening crucial salmon and steelhead populations.

### Why Care?

Washington has invested billions of dollars in the Columbia River region in salmon recovery. If Northern Pike become established further down the Columbia River, the vital salmon runs of the river and its surrounding tributaries, and all the resources invested in their recovery are in jeopardy.



Adam Sepulveda, US Geologic Survey

Salmon fishing is also a big business in Washington. Recreational anglers spend over \$1 billion in Washington State on trip-related expenses, such as restaurants, motels, gas, convenience and sporting goods stores, creating more than 14,600 jobs. Further, tribal fisheries, both commercial and ceremonial, would suffer if Northern Pike decreased salmon numbers.

Stocking and introductions of illegal fish species, such as Northern Pike, jeopardize jobs and costs hundreds of thousands of taxpayer dollars to remove.

## DO YOUR PART

### Catch. Kill. Report.

If found or caught, kill the Northern Pike. **DO NOT** release. There are no catch limits on Northern Pike.

### IT'S THE LAW

It is **ILLEGAL** to leave Washington waters with live Northern Pike.  
You **CANNOT** transport live fish without a permit.

### REPORTING

To report a catch and/or location:

#### WASHINGTON

- ☎ 1-360-902-2700
- ✉ fishpgm@dfw.wa.gov
- Create a report at [invasivespecies.wa.gov](http://invasivespecies.wa.gov)
- Use the 'WA Invasives' app on iOS or Android

#### OREGON

- ☎ 1-866-INVADER
- ✉ invasive.species@state.or.us
- Create a report at [oregoninvasiveshotline.org](http://oregoninvasiveshotline.org)

Report releasing or transport of pike to the police or your local county sheriff's department.



**STOP THE SPREAD  
OF INVASIVE  
NORTHERN PIKE**



Northern Pike pose a significant threat to Oregon and Washington salmon and steelhead.

**IF CAUGHT DO NOT RELEASE.**

Photograph and Report to your state Department of Fish and Wildlife.



## IMPACTED AREAS

In Washington, Northern Pike were illegally introduced into the Pend Oreille River and have spread from there. They are currently known to be established above the Grand Coulee Dam. They are negatively affecting the upper reaches of the Columbia River watershed and surrounding tributaries in Washington, Idaho, Montana and Canada. They are only two dams away from vital spawning habitat, where they would threaten valuable fisheries, native species, and the ecosystem.



Native American tribes, public utility districts and state agencies are working together to prevent further downstream spread of Northern Pike.

## IDENTIFICATION

Everyone can help by learning how to identify Northern Pike and reporting them if found.

**Pattern:** lateral rows of white to yellow, bean-shaped spots.

**Shape:** Typically longer and have a snake like look compared to other native fish species.



**Dorsal (top) fin:** extends far back, much closer to the tail than on many other fish species. Fins have black blotches and are usually yellow, orange or red in color.

**Turn it on its head:** there are up to five pairs of sensory pores on the underside of a pike's jaw, meant for picking up vibrations in the water.



## KNOW THE DIFFERENCE

A native fish often confused with Northern Pike due to their similar names is the Northern Pikeminnow. While considered a nuisance fish, Northern Pikeminnow are native to the Pacific Northwest. While the two fish share similar names, they differ greatly in appearance.



### Northern Pike

- Olive green color
- Horizontal, bean-shaped spots
- 1-5 sensory pores
- Duck-bill shaped snout
- Sharp teeth
- Average 26 inches and 4 pounds

United States Fish and Wildlife Service, Timothy Knepp



### Northern Pikeminnow

- Silver color (darker depending on habitat)
- No spots
- No sensory pores
- Long mouth, ends below its eye
- No teeth
- Average 15 inches and 1 pound

Washington Department of Fish and Wildlife

Appendix Figure F-4. Northern Pike brochure provided by the Washington Invasive Species Council.

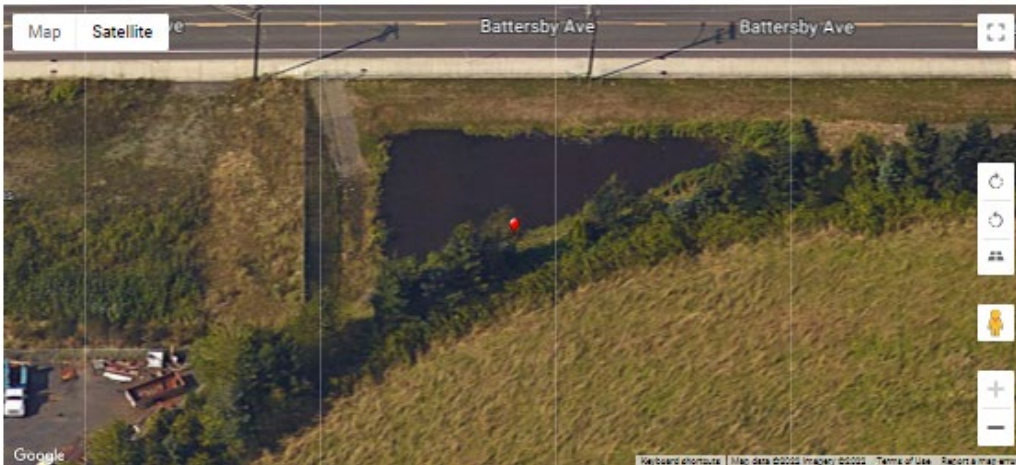


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- DISTRIBUTION MAPS
- SPECIES INFORMATION
- TOOLS & TRAINING
- MY EDDMAPS
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## American bullfrog *Lithobates catesbeianus* Shaw, 1802

<b>Record ID</b>	<b>10611975</b>	<a href="#">Download Record (pdf)</a>
<b>Location Information</b>		
Locality	Retaining pond on Battersby Street.	
Location	King, Washington, United States	
Coordinates	47.20628,-121.98092	
<b>Infestation Information</b>		
Infestation Status	Positive	
<b>Reporter Information</b>		
Reporter	Kathy Conzelman	
Observation Date	July 12, 2022	
Date Entered	July 15, 2022	
Source Type	Web Report	
Reported By	Kathy Conzelman	
Email	kmcpta@gmail.com	
Phone Number	3608251843	
<b>Species Information</b>		
Life Status	Alive	
<b>Verification and Review</b>		
Reviewed	Not Verified	
<b>Survey Information</b>		
Datum	WGS84	
Comments	Heard more than one, but only saw this one. It was almost sunset, so picture quality poor. I think it is American Bullfrog.	
<b>Other</b>		
Location/Jurisdiction	US Congressional District WA-8	



Appendix Figure F-5. Example of an aquatic invasive species report.

APPENDIX G Stakeholder Meeting Data Summary Form

# Northern Pike Rapid Response Stakeholder Meeting Data Summary Form

Initial detection date: \_\_\_\_\_

Initial detection location (lat/long and description): \_\_\_\_\_

Rapid Response Lead name: \_\_\_\_\_

**Table 1. Field Lead name(s)**

Name	Waterbody

**Table 2. Verification efforts**

Sampling date	Gear	Effort	Lat	Long	Present?

**Table 3. Initial scoping efforts**

Sampling date	Gear	Effort	Lat	Long	Present?
	eDNA				
	eDNA				
	eDNA				
	eDNA				
	eDNA				



## APPENDIX H Species-Specific Spatiotemporal Distributions

**Appendix Table H-1. Spatiotemporal representation of life history stages in the study portion of the Columbia River mainstem and Okanogan River for focal fish species. Dark (saturated) cells indicate data obtained from the Columbia River DART database, whereas light cells indicate data extracted from relevant subbasin reports.**

Reservoir	Life Stage	Month												
		1	2	3	4	5	6	7	8	9	10	11	12	
Wells	<b>Adult Migration</b>		Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	
	UCR Steelhead (Summer)							Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue		
	UCR Chinook - All Runs				Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Light Blue	
	<i>UCR Chinook - Spring</i>				Light Blue	Dark Blue	Dark Blue	Dark Blue						
	<i>UCR Chinook - Summer</i>						Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue		
	<i>UCR Chinook - Fall</i>						Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue		
	UCR Sockeye - All Runs							Dark Blue	Light Blue	Light Blue				
	<i>Wenatchee River</i>						Light Blue	Light Blue	Light Blue					
	<i>Okanogan River Sockeye</i>						Light Blue	Light Blue	Light Blue					
	Coho								Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	
	Bull Trout		Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue						
	Lamprey							Dark Blue	Dark Blue	Dark Blue				
	White Sturgeon				Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue		
	<b>Adult Spawning</b>					Light Red	Light Red	Light Red	Light Red	Light Red	Light Red	Light Red	Light Red	Light Red
	UCR Steelhead (Summer)								Light Red	Light Red	Light Red	Light Red	Light Red	Light Red
	UCR Chinook - All Runs								Light Red	Light Red	Light Red			
	<i>UCR Chinook - Spring</i>									Light Red	Light Red	Light Red	Light Red	
	<i>UCR Chinook - Summer</i>									Light Red	Light Red	Light Red	Light Red	
	<i>UCR Chinook - Fall</i>													
	UCR Sockeye - All Runs													
	<i>Wenatchee River</i>													
	<i>Okanogan River Sockeye</i>													
	Coho													
	Bull Trout													
	Lamprey													
	White Sturgeon				Light Red	Light Red	Light Red	Light Red						
	<b>Juvenile Migration</b>		Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow
	UCR Steelhead (Summer)				Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow
	UCR Chinook - All Runs				Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow
	<i>UCR Chinook - Spring</i>				Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow
	<i>UCR Chinook - Summer</i>						Light Yellow	Light Yellow	Light Yellow					
	<i>UCR Chinook - Fall</i>						Light Yellow	Light Yellow	Light Yellow					
	UCR Sockeye - All Runs				Light Yellow	Light Yellow	Light Yellow	Light Yellow						
	<i>Wenatchee River</i>				Light Yellow	Light Yellow	Light Yellow	Light Yellow						
	<i>Okanogan River Sockeye</i>				Light Yellow	Light Yellow	Light Yellow	Light Yellow						
	Coho				Light Yellow	Light Yellow	Light Yellow	Light Yellow						
	Bull Trout						Light Yellow	Light Yellow	Light Yellow	Light Yellow				
	Lamprey				Light Yellow	Light Yellow	Light Yellow	Light Yellow						
	White Sturgeon		Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow						

Reservoir	Life Stage	Month												
		1	2	3	4	5	6	7	8	9	10	11	12	
Rocky Reach/Rock Island	<b>Adult Migration</b>		■	■	■	■	■	■	■	■	■	■	■	■
	UCR Steelhead (Summer)													
	UCR Chinook - All Runs				■	■	■	■	■	■	■	■	■	■
	<i>UCR Chinook - Spring</i>				■	■	■	■						
	<i>UCR Chinook - Summer</i>						■	■	■	■	■	■	■	■
	<i>UCR Chinook - Fall</i>						■	■	■	■	■	■	■	■
	UCR Sockeye - All Runs						■	■	■	■				
	<i>Wenatchee River</i>						■	■	■	■				
	<i>Okanogan River Sockeye</i>						■	■	■	■				
	Coho								■	■	■	■	■	■
	Bull Trout		■	■	■	■	■	■	■	■	■	■	■	■
	Lamprey								■	■	■	■		
	White Sturgeon				■	■	■	■	■	■	■	■		
	<b>Adult Spawning</b>				■	■	■	■	■	■	■	■	■	■
	UCR Steelhead (Summer)													
	UCR Chinook - All Runs								■	■	■	■	■	■
	<i>UCR Chinook - Spring</i>								■	■	■	■		
	<i>UCR Chinook - Summer</i>									■	■	■	■	■
	<i>UCR Chinook - Fall</i>									■	■	■	■	■
	UCR Sockeye - All Runs													
	<i>Wenatchee River</i>													
	<i>Okanogan River Sockeye</i>													
	Coho													
	Bull Trout													
	Lamprey													
	White Sturgeon				■	■	■	■						
	<b>Juvenile Migration</b>	■	■	■	■	■	■	■	■	■	■	■	■	■
	UCR Steelhead (Summer)				■	■	■	■	■	■	■	■	■	■
	UCR Chinook - All Runs				■	■	■	■	■	■	■	■	■	■
	<i>UCR Chinook - Spring</i>				■	■	■	■	■	■	■	■	■	■
	<i>UCR Chinook - Summer</i>					■	■	■						
	<i>UCR Chinook - Fall</i>					■	■	■						
	UCR Sockeye - All Runs				■	■	■	■						
	<i>Wenatchee River</i>				■	■	■	■						
<i>Okanogan River Sockeye</i>				■	■	■	■							
Coho				■	■	■	■							
Bull Trout							■	■	■	■				
Lamprey				■	■	■	■	■	■	■				
White Sturgeon	■	■	■	■										
<b>Adult Migration</b>		■	■	■	■	■	■	■	■	■	■	■	■	
UCR Steelhead (Summer)														
UCR Chinook - All Runs				■	■	■	■	■	■	■	■	■	■	



Reservoir	Life Stage	Month											
		1	2	3	4	5	6	7	8	9	10	11	12
	<i>UCR Chinook - Spring</i>				■	■							
	<i>UCR Chinook - Summer</i>						■	■	■	■	■	■	
	<i>UCR Chinook - Fall</i>						■	■	■	■	■	■	
	<i>UCR Sockeye - All Runs</i>						■	■	■				
	<i>Wenatchee River</i>						■	■	■				
	<i>Okanogan River Sockeye</i>						■	■	■				
	Coho								■	■	■	■	■
	Bull Trout		■	■	■	■	■	■	■	■	■	■	■
	Lamprey							■	■	■	■		
	White Sturgeon				■	■	■	■	■	■	■		
	<b>Wanapum/Priest Rapids</b>	<b>Adult Spawning</b>				■	■	■	■	■	■	■	■
<i>UCR Steelhead (Summer)</i>													
<i>UCR Chinook - All Runs</i>								■	■	■	■	■	
<i>UCR Chinook - Spring</i>								■	■	■			
<i>UCR Chinook - Summer</i>									■	■	■		
<i>UCR Chinook - Fall</i>									■	■	■		
<i>UCR Sockeye - All Runs</i>													
<i>Wenatchee River</i>													
<i>Okanogan River Sockeye</i>													
Coho													
Bull Trout													
Lamprey													
<i>White Sturgeon</i>					■	■	■	■					
<b>Juvenile Migration</b>		■	■	■	■	■	■	■	■	■	■	■	■
<i>UCR Steelhead (Summer)</i>				■	■	■	■	■	■	■	■	■	■
<i>UCR Chinook - All Runs</i>				■	■	■	■	■	■	■	■	■	■
<i>UCR Chinook - Spring</i>				■	■	■	■	■	■	■	■	■	■
<i>UCR Chinook - Summer</i>					■	■	■	■					
<i>UCR Chinook - Fall</i>					■	■	■	■					
<i>UCR Sockeye - All Runs</i>					■	■	■	■					
<i>Wenatchee River</i>				■	■	■	■						
<i>Okanogan River Sockeye</i>				■	■	■	■						
Coho			■	■	■	■	■						
Bull Trout						■	■	■					
Lamprey				■	■	■	■						
White Sturgeon	■	■	■	■								■	